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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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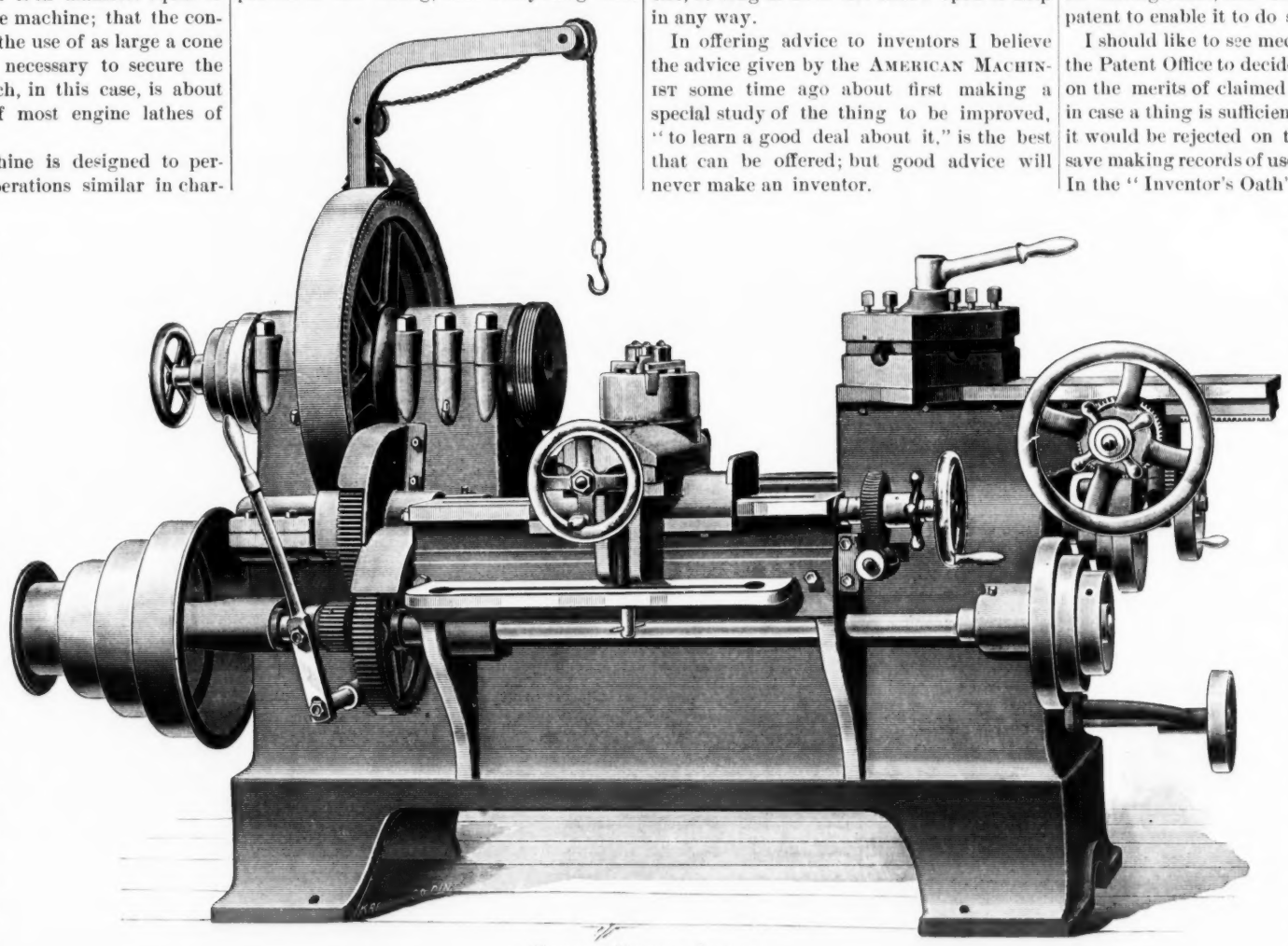
Turret Engine Lathe.

In our issue of June 23d we illustrated and described a new lathe, built by the Ohio Machine Tool Works, and now illustrate a modification of the tool designed for special work, and built by the successor of the above mentioned company, the Lodge & Shipley Machine Tool Co., Cincinnati, O.

The present illustration will recall the principal features of the machine, which are that the bed, head-stock and slides which support the rests are cast solid in one piece; that the driving gear is in diameter equal to the full swing of the machine; that the construction admits of the use of as large a cone pulley as may be necessary to secure the driving power, which, in this case, is about three times that of most engine lathes of equal swing.

The present machine is designed to perform on castings operations similar in character to those performed upon forgings and bar iron by the ordinary turret lathe. The spindle is 6″ diameter, and has a hole through it 3¾″ diameter. To this spindle can be fitted any desired form of chuck for holding parts of engines or other machines to be bored or turned, the cross-slides of the tool rests being adapted to turn taper or other forms by means of slotted plates, as shown in our previous illustration referred to above.

All feeds have been made powerful, in accordance with the general scope of the machine. The tool-rests are designed to use ¾″x1½″ steel. For the sake of securing the maximum rigidity the bearings for the main spindle are formed directly in the casting which forms the bed and head-stock, no linings of any kind being used, but the spindle bearing directly upon the cast metal, which is bored and scraped to fit the spindle. The bearings, moreover, take up all the length of the spindle except that needed for securing the main driving gear. By moving the vertical lever seen in front of the machine, two ratios of speed are obtained between the cone pulley and spindle—one being 30 to 1, and the other 2 to 1. The boring bars are given a bearing in the spindle when desired, and when very long may be put in position through the spindle, if more convenient. A crane is put on for convenience in handling work, and the machine has proved very efficient as a chucking lathe on account of its exceptional power and stiffness, while by the addition of a special rest and tool holder it becomes a cutting off machine well suited to the heaviest work. The machine weighs 5,000 pounds.



TURRET ENGINE LATHE.

Inventors and Patents.

BY A MECHANIC.

From what I have seen written lately about Patent Law and the Patent Office, and what I have seen myself, I judge the Patent Office to be more satisfactory to the government than to inventors. I don't believe there is a sensible person in the world who will say that inventors do not deserve to be well paid for their work.

I want to say, without any fear of being proven in the wrong, that everything that man boasts off as superior to dumb animals started with somebody's invention.

Some time ago I saw an article in the AMERICAN MACHINIST in which the writer claimed there was need of a new name to distinguish inventors by, for the reason that there are so many impostors in the business that the real inventors are misjudged. Now, if this sort of thing is going to be done in all lines of business, I think new names will come so fast that people cannot keep track of them. There are impostors everywhere, but in invention like everything else, the genuine article is known more by the work he does than by the name.

For this reason I think the name ought to be good enough. I think I have seen impostors who claimed to be machinists, and, on account of their ability of driving a sharp bargain with foremen who were also impostors, got better pay than the genuine article, but I never heard of an impostor inventor who ever made a cent. Inventors are on job work. They must first do their work, then advance their money, and then they will find usually that unless their work has been done *extra* well, and their money invested with *extra* judgment, that their pay is very hard to get.

I have heard lots of contempt expressed from some people for those who try to devise new things. These people never do such a thing, for the reason they claim to be too smart, but we can think differently if we want to.

For my part, I fail to see why anybody should get excited if his neighbor chooses to build a new-fangled air castle, or anything else, so long as he is not called upon to help in any way.

In offering advice to inventors I believe the advice given by the AMERICAN MACHINIST some time ago about first making a special study of the thing to be improved, "to learn a good deal about it," is the best that can be offered; but good advice will never make an inventor.

Hard lessons of experience are the ones that take a deep root. There are people every day who are working hard and spending considerable money, for which they will never get a cent in direct return, for the reason that they are on the wrong track. Some will profit by their failure this time by the knowledge they gain, while others will just simply blame the luck and let it go at that. I believe the greatest part of an inventor's business must be learned by his being knocked about by some hard bits of experience.

He must learn what not to do. He must learn to hold himself back and take time to properly develop things. He must learn to look at his own work through the eyes of a disinterested outsider. He should be able to hold his enthusiasm in check at times while he properly investigates a subject.

As a general thing I think inventors earn a great deal more than they ever get, and I believe the Patent Office should provide for them better protection than it does.

The Patent Office, as it is, is of value as a keeper of records. The office furnishes through its Official Gazette and other papers good means of finding out what is going on in the country in the way of new things; aside from this, if it is of any value it is very small.

You pay your money for a patent, and then, if there is any trouble comes up, you find that you have to furnish more money to protect yourself.

What I should like to see would be to have the government do the prosecuting in case of an infringement, and charge enough for a patent to enable it to do so.

I should like to see mechanics employed in the Patent Office to decide as far as possible on the merits of claimed inventions, so that, in case a thing is sufficiently lacking in merit, it would be rejected on this account, and so save making records of useless reading matter. In the "Inventor's Oath" there is something said about new and *useful*.

A great many of the things we see in the Official Gazette may be new, but I doubt if some of them are useful. If the Patent Office would exhaust every means in its power in finding out about whether an invention is new and useful, and then, in case it is found as claimed, a patent is issued which will be backed up by the government in all necessary protection, it would be a great improvement over the present arrangement. Such a patent would no doubt cost more than a patent costs now, but would it not be worth more to the ordinary run of inventors? Insurance companies figure on the chances, and I fail to see why the government could not figure in some such way in fixing the price of a patent that *will protect*.

In case of an infringement an inventor should be able to notify the proper parties at the Patent Office, and have them take the necessary steps in investigating the matter and in protecting the inventor's interests.

I believe the greatest cause for all the useless patents that are issued are dishonest patent lawyers, who are so anxious after fees that they will encourage any foolish thing, and as they are smart enough to write up a set of claims for a supposed invention that is no value to the inventor, and do not stand in the way of anything else in existence, they are usually successful.

The post-office department is considering plans for putting up a letter box at every house in cities where there is free delivery. A rather senseless operation, we think.

Rubber Pattern Work.

BY JOHN T. USHER.

No mention has been (purposely) made of using "oil" for coating the plaster face patterns, impressions and casts, to facilitate the separating or opening of the same, after a counter impression or cast has been poured or made of them, as the surfaces of the counter impressions or casts will have much the same appearance as they would have if "soap water" had been used (as explained elsewhere); and furthermore, as the oil is absorbed by the plaster, the mold surfaces do not present as smooth and solid an appearance, and are not as well adapted for rubber work as when the face patterns, impressions and casts have been shellaced, and when dry, soaked in water (as explained before) prior to having a counter impression or cast poured or taken of them. Modelers in plaster, etc., when making face patterns and blanks for rosettes and other ornate figures and designs, upon which much carving or cutting has to be done, frequently use an admixture of some other ingredient with the plaster, such as mucilage, dextrine, gum arabic and marshmallow plant, to strengthen the plaster and make it better adapted to withstand the operation of cutting and carving the figures and designs thereon. A little of whichever ingredient is used is stirred in with the water with which the plaster is to be mixed, prior to adding the plaster thereto. Occasionally during the operation of separating plaster impressions, etc , a piece or pieces of the same may become detached or broken off, in which case as the "piece or pieces" usually break off with clean and well-defined edges, the broken piece or pieces may be easily replaced and cemented on again with liquid silex or Sandarac varnish (alcoholic), or after dipping the impression and broken piece or pieces in water, with a very thin solution of plaster, cementing the broken parts together, while still wet, as quickly as possible.

METAL FLASKS.

The metal flask (Figs. 28, 29, and 30) is one which I have designed for my own use for making rubber patterns with plaster molds. In the design of this flask the following points of utility had to be considered:

First, the advisability of having the plaster molds as compact as possible, by avoiding all tendency to have the investment, body, or mass of plaster surrounding the molds thicker or larger than is absolutely necessary to allow of a complete mold being made in the smallest possible flask area, or, in other words, to allow the outer surface of the molds to come as near to the metal walls of the flask as possible, and also to avoid the use of any unnecessary amount of plaster when investing or making said molds for economy's sake.

Secondly, to allow of the flask being adapted to each particular form of pattern which many present in ordinary practice, by using the flask as follows when necessary:

With one ring for the "nowel" and one ring
N. C.
for the "cope," say *A* and *D*.

With two rings for the "nowel," and two
N. C.
rings for the "cope," say *A*, *B* and *C*, *D*.

With three rings for the "nowel," and one
N. C.
ring for the "cope," say *A*, *B*, *C* and *D*.

With one ring for the "nowel," and three
N. C.
rings for the "cope," say *A*, and *B*, *C*, *D*.

With one ring for the "nowel," and two
N. C.
rings for the "cope," say *A*, and *B*, *C*.

The flasks consists of four rings, *A*, *B*, *C* and *D*, and two covers *E* and *F* (Figs. 28, 29 and 30), and also two additional covers (not shown) similar to the covers *E* and *F* (Figs. 28 and 30), but large enough to fit the rings *B* and *C* (Fig. 28) at *N* and *N*, when but two or three rings are needed for use at one time. The rings *A* and *D* (Figs. 28 and 29) have each two guide lugs, *I I*, which fit into the guide grooves or slots *J J* of the rings *B* and *C*, and also two additional guide grooves or slots *M M* (Fig. 29), into which the guide pins *I I* fit when these two rings are used together as a separate flask. Centrally located on the upper edge of the ring *A*, and the lower edge of the ring *D* respectively (Figs. 28 and 29), at *H*, *H*, *H*, *H* is a small notch, into which the guide lugs *G*, *G*, *G*, *G* (Figs. 28 and 30) of the covers fit to locate the covers centrally with the rings; two similar notches are also made in the rings *B* and *C* at *P P* (Fig. 28) for the same purpose, but are only used when these two rings are to be used as a separate flask, together with the two additional covers (not shown) mentioned above, or with one of these additional covers when it is desired to use but three rings to make up a flask. The guide lugs *R* of the ring *B* fit into the guide grooves *L* of the ring *C* (Fig. 28). The bolt holes and the bosses (marked *O*) on the rings and in the covers are proportioned for $\frac{1}{4}$" or $\frac{5}{16}$" bolts in practice. The number of bolts used may vary from three upwards, according to size of flask; the guide bosses (marked *O*) need not in the larger sized flasks be extended the whole depth or width of the rings, but must in all cases be made in such manner that they will form a support for the flask covers, to prevent the covers from springing when the bolts have been tightened up on the same prior to vulcanizing, after the molds have been packed with rubber. The drawing shows the flask one-half size, but a flask made the same size as the drawing could be used to better advantage on small, flat work, such as the base plate patterns (Figs. 21 and 22), the bolt holes and bosses for the same being proportioned for $\frac{1}{4}$" bolts, and the covers being made about twice as heavy as per drawing; the taper or bevel on the sides and ends of ring equal $\frac{1}{2}$" in one inch. The patterns from which the flask rings and covers are to be made in metal should consist of one pattern for each size of ring required, as *A* and *B*, and two cover patterns for the covers, one for the cover *E*, and one for the cover which fits the ring *B*, these ring and cover patterns being duplicates of the rings *C* and *D*, and the cover *F*, and the ring cover for *C*. The guide lugs *I* and *K* are not to be cast as a part of the flask rings, guide grooves the same as *J* and *L* being made in the place thereof, and the guide lugs *I* and *K* being afterwards made by riveting iron or steel strips in said grooves; this arrangement allows of future adjustment being made, as the guide grooves and lugs become worn with use, by truing up the guide grooves, and replacing the guide lugs with larger ones, as required. Metal flasks of various patterns may be used, as preferred. Those used by dentists could be used on such patterns as are not too large to fit therein. These flasks, which are made of malleable iron and brass, can be bought at any dental depot for from 80 cents to $1.50, according to pattern and make, and metal of which they are made. The flask rings and covers can be made of cast iron, but brass is much better, on account of its non corrosive properties. For making an occasional pattern or article, a wooden flask or frame, or even a tin box, held by wire or otherwise, may be used, but of course the accuracy of the pattern or article would depend on the condition of the same.

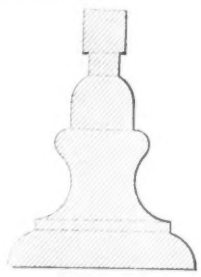


Fig. 31.

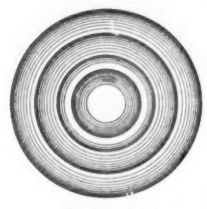


Fig. 32.

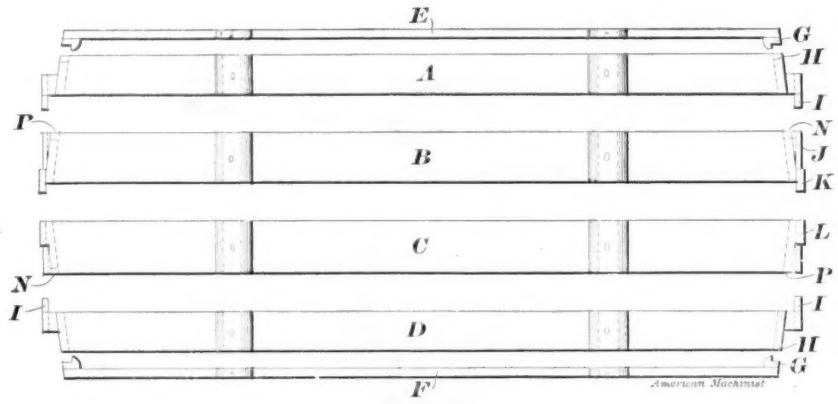


Fig. 28.

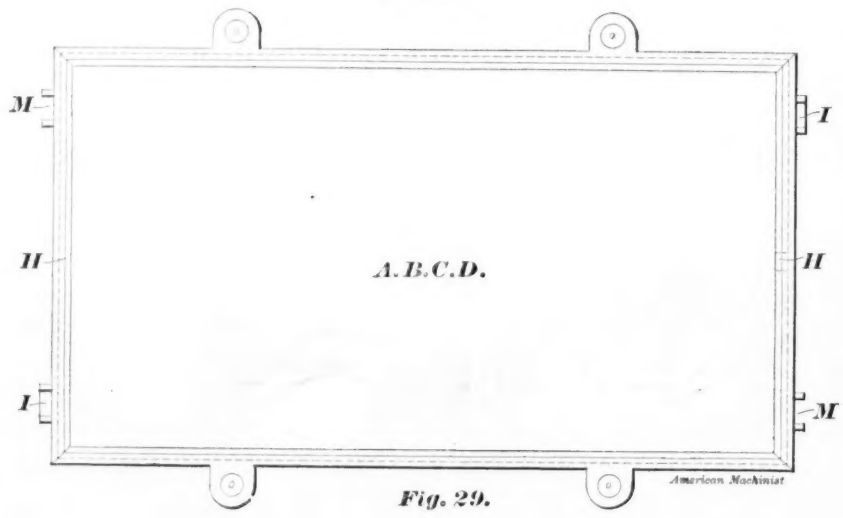


Fig. 29.

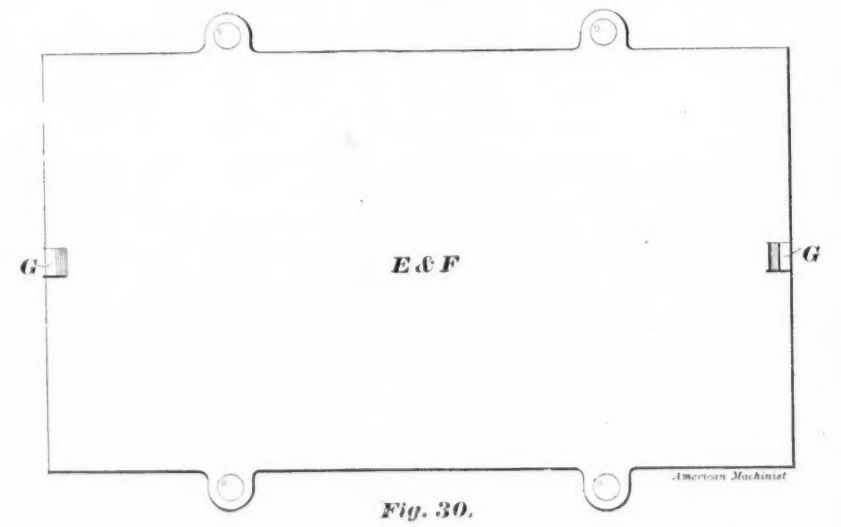


Fig. 30.

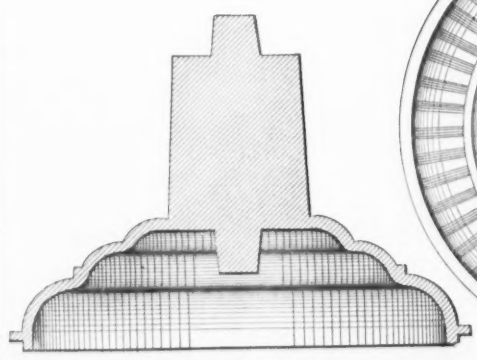


Fig. 33.

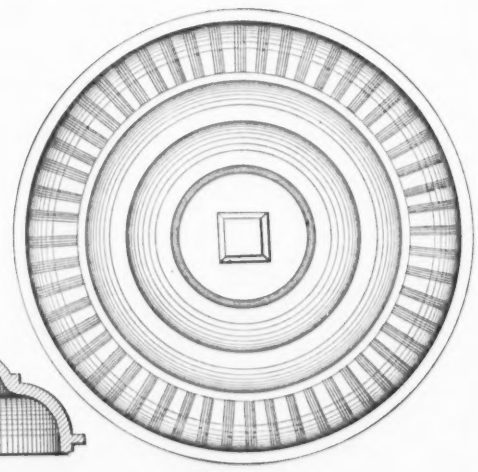


Fig. 34.

FLASKING.

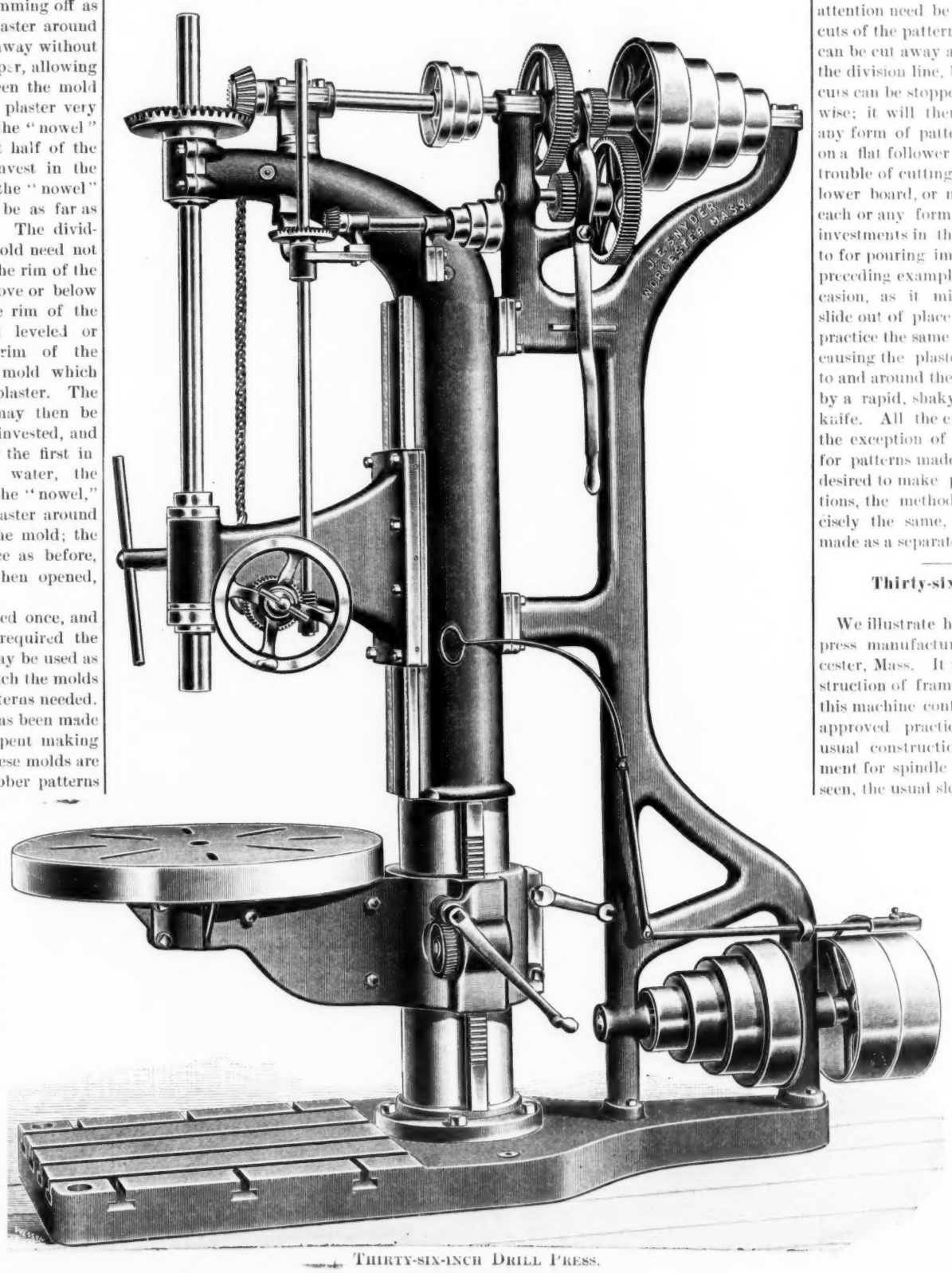
If a plaster mold is made or invested in the flask, it is called by rubber workers "flasking" (which term is analogous to "molding" in foundry practice), when these molds are made from preliminary patterns, or when the molds are made outside the flask, and afterwards invested (imbedded) therein with plaster. Almost any plaster mold can be formed or made as well or better in the flask than separate; for instance, if it is desired to make a mold in the flask for the half "door knob" patterns, Figs. 17 and 18, March 17, take one ring and one cover or lid for the "nowel" of the flask; into this pour enough plaster to make the inner surface mold (Fig. 20 *a'*) The "nowel" can then be fastened on the face-plate of a lathe, and the blank or inner surface mold turned as required; upon this the preliminary pattern is made with wax or other material, as already explained for making the face pattern (Fig. 19 *a*) When this has been done, the exposed surface of plaster around the preliminary pattern is to be coated with soapy water, the "cope" placed in position, and the outer surface mold made by pouring a little plaster on the highest part of the preliminary pattern; then taking the flask in the hands, and causing the plaster to flow to and around the lower parts of the pattern by jarring; a little more plaster is then added, the jarring repeated, and so on, until the flask is full; the cover is then pressed into place, in doing which the surplus plaster is all forced out of the flask, the flask laid aside until the plaster has set, when the surplus plaster on the outside of the flask may be cut or trimmed off. When the investment is made upon a wax pattern or model (as in this case) it is safer to warm the flask prior to opening it, which can be done while the plaster is hardening and setting. The flask is then opened or separated by inserting a knife blade or anything else between the "nowel" and "cope" and prying them apart, the wax picked or

scalded off and out of the mold surfaces as necessary, and the mold is ready to have the rubber packed therein. The base plate patterns (Figs. 21 and 22) may be formed or made in a similar manner, using one cover and one ring for the "nowel," and the same for "cope." When the molds are made in the flask, it will not be necessary to have any guide rings, grooves, or dowel point for locating the two halves of the molds together, as the guide grooves and lugs on the rings serve the same purpose.

To invest a mold that has been made outside of or separate from the flask, it is only necessary to select a flask which is large enough to hold the whole mold, or that will hold the mold by culling or trimming off as much of the body or mass of plaster around the mold as can be safely cut away without injuring the mold surfaces proper, allowing a small space all around between the mold and the flask. Then mix some plaster very thin, place some of the same in the "nowel" of the "flask"; now take that half of the mold that it is intended to invest in the "nowel," and press it down in the "nowel" as far as desired, which should be as far as the dividing or separating line. The dividing or separating line on the mold need not of necessity be on a line with the rim of the "nowel"—it may be either above or below it, and the space between the rim of the "nowel" and the half mold leveled or beveled off (even with the rim of the "nowel" and edges of the mold which bound the dividing line) with plaster. The other half of the "mold" may then be placed in position on the half invested, and the exposed plaster surface of the first investment coated with soapy water, the "cope" placed in position on the "nowel," and the flask filled up with plaster around and above the second half of the mold; the cover is then pressed into place as before, and the flask (or mold) is, when opened, ready for packing.

Plaster molds can only be used once, and where subsequent patterns are required the first rubber pattern produced may be used as a preliminary pattern, from which the molds may be made for all future patterns needed. When a preliminary pattern has been made or is available, then any time spent making molds outside of the flask (if these molds are to be used for making the rubber patterns in) is so much time wasted. When the molds are to be made of plaster, as mentioned above, by using a pattern made of metal or rubber, or any material harder than wax, modeling clay, or composition, some difficulty may be experienced in taking the pattern out of the mold, in which case the pattern may be taken out more readily if a pointed instrument be inserted under one edge at the most convenient point of the pattern, and gently prying it out. No specific directions can be given for investing or making molds from preliminary patterns other than those already given. Much will depend on the shape or form of the pattern to be invested; with some forms of patterns it will only be necessary to pour as much soft plaster as required into the "nowel" of the flask, and while the plaster is still soft to press the pattern into that as far as the division line of the pattern, or as far as desired, and to add more or scrape the plaster off even with the division line, as required. With other forms of patterns a flat follower board may be used (which has been previously shellaced and oiled) with holes cut in the same for the guide lugs of the flask rings to fit into. I will give three examples of flasking with preliminary patterns. Figs. 31 and 32 show sectional and top views of an "acorn" nut pattern. In flasking this pattern some soft plaster was poured into the "nowel" of the flask; the pattern was then pressed into this as far as the division line, and the plaster leveled off even with the same; the plaster surface was then coated with soapy water, the "cope" placed in position, and a counter impression or mold poured, as explained for the preceding examples given; when the flask was opened and the pattern removed, it was ready for packing.

Figs. 33 and 34 show sectional and top views of the inner half of a door knob pattern, and was flasked as follows: The plaster was mixed quite thin, and some of it was poured into the "nowel" of the flask; an impression was then poured of the inside of the pattern by filling the same with the plaster; the pattern was then laid aside until the plaster had set just enough to prevent the plaster from falling out of the inside of the pattern when the pattern was inverted; the pattern was then pressed into the plaster in the "nowel" as far as the upper edge of the flange shown in Fig. 33, the plaster in the "nowel" and that in the inside of the pattern coalescing; the plaster in the "nowel" was then leveled off with the upper edge of the flange mentioned above; the surface of plaster was then coated with soapy water, the "cope" placed in position on the "nowel." Prior to pouring a counter impression or mold, a piece of wax was rolled (in the hands) about ¼" diameter, and long enough to reach (when tacked on the top of the square core print) above the top of the cope; a counter impression or mold was then poured as before, and the cover pressed into place; when the plaster was hard, the flask was opened by inserting a knife blade between the "nowel" and "cope" rings, and prying them apart, repeating this at different parts of the flask, to avoid breaking the molds. When the flask was opened, the pattern still remained imbedded in the "cope"; to remove it, the cover of the "cope" was taken off, the piece of wax mentioned above picked out; a piece of wire was then placed in the hole where the wax had been, and by gently tapping the wire the pattern was driven out; the hole was then filled up with wet paper, to prevent the rubber from afterwards flowing therein. This latter method may appear to the readers to be unnecessarily tiresome and prolonged, but I would remind them of the fact that we are not molding in "sand" or "loam," and that there is no "rapping" of the patterns to loosen them, as with the latter materials, and that, though the patterns may be oiled prior to investing the same in the flasks, everything that can must be done to facilitate the removal of the patterns from the molds without running any risks of damaging the molds, as the plaster adheres to the pattern with surprising tenacity. Personally, I do not advocate oiling the patterns—simply wetting them is enough. To invest the patterns given in the last example (Figs. 33 and 34), using the follower board mentioned above to invest on, the order of things would be reversed, the outside impression or mold being made in the "nowel" of the flask, and the inner surface mold in the "cope," as follows: Place the "nowel" in position on the follower board, then (after fixing the piece of wax on the core print of the pattern, as in the preceding example) lay the pattern on the follower board inside the "nowel," paying no attention to the undercut below the "flange"; then proceed to make up the investment, as already explained. When the plaster has set or hardened, take off the follower board, and cut away the plaster as far as the division line (this time as far as the lower edge of the "flange"); and after soaping the plaster investment, as before, place on the "cope," and make up or pour the inner surface mold when the flask has been opened; the pattern may be removed as before. Generally no attention need be paid to any slight undercuts of the patterns, as the plaster investment can be cut away as far or below the same to the division line, but if preferred the undercuts can be stopped off with paper or otherwise; it will therefore be seen that almost any form of pattern can be readily invested on a flat follower board without going to the trouble of cutting out or building up the follower board, or making a special board for each or any form of pattern; but in pouring investments in this way the jarring referred to for pouring impressions and molds in the preceding examples may be inapt for the occasion, as it might cause the pattern to slide out of place in the flask, but by a little practice the same results can be attained by causing the plaster to flow from the higher to and around the lower parts of the pattern by a rapid, shaky movement of the plaster knife. All the examples given so far (with the exception of the half shell pattern) are for patterns made in one piece. Where it is desired to make patterns (of rubber) in sections, the methods to be followed are precisely the same, but each section must be made as a separate pattern.



THIRTY-SIX-INCH DRILL PRESS.

Thirty-six inch Drill Press.

We illustrate herewith an improved drill press manufactured by J. E. Snyder, Worcester, Mass. It will be seen that in construction of frame and general arrangement this machine conforms to the modern and approved practice, and differs from the usual construction mainly in the arrangement for spindle traverse, where, as will be seen, the usual sleeve is dispensed with, and the spindle does not traverse through the bearing in the arm. Instead of this the arm moves upon the face of the column, upon which it has a carefully fitted and gibbed bearing 18" long, and with an automatic feed movement of 29". This adapts it for doing jobs of deep drilling or boring, and as the head is instantly moved by means of a lever without the necessity for loosening the head from the column, bearings which are in line with each other in the same frame, but are separated by a cored or open section, can be bored with the greatest possible facility short of a special duplex boring machine. The head and spindle moving together are, of course, counterbalanced by a single weight. The table is moved up or down by a worm and wheel, and so cannot fall. The back gear is thrown in or out by the movement of the lever shown. The proportion of these gears being 5 to 1, and of the bevel gears 2 to 1, the cone pulley turns 10 to 1 of the spindle. Spindle is of crucible steel, 2¼" diameter, and thrust is taken on a Brownell conical roller bearing, which reduces friction to a minimum, and is in every way satisfactory for this service. By pulling out the lever in front, the hand-wheel feed is obtained without the necessity for disconnecting any gears.

The entire machine is designed for heavy work, its weight being about 4,000 pounds.

Several other sizes are made of the same design.

Years ago it seemed to be an undoubted fact that in years when presidential elections occurred the conditions of business were unfavorable. The country has, fortunately, outgrown this, and, notwithstanding the raving of political speakers, business is likely to go on the same as ever, which fact shows good common sense on the part of the people.

Gascon Discourses Upon Some Shortcomings in Text-books—Still More Confusing.

BY JARNO.

Professor MacCord is a little confusing in a sentence upon diametral pitch in a gear; and Professor Unwin, in attempting to remove what he supposes to be confusing, has added a confusion.

"In Kinematics, or Mechanical Movements, page 177, Prof. MacCord states, 'In the use of this system, convenient values of diametral pitch are selected, each being a fraction with unity for its numerator and an integer for its denominator, as 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, etc. Only the denominators of these fractions are commonly used in giving the diametral pitch.' 1 is a convenient number, but not a good example of a fraction. Turning to the last leaf, I notice a page not devoted to mechanical movements, on which, in a column of numbers headed Diametral Pitch, which are the Professor's denominators, I see $1\frac{1}{2}$, $2\frac{1}{2}$ and $3\frac{1}{2}$. These fractional numbers strike me as being rather odd, after the statement that each value of the diametral pitch has unity for its numerator and an integer for its denominator. If we put one of these diametral pitches, say $1\frac{1}{2}$, into the Professor's form, as near as we can, it becomes $\frac{1}{1\frac{1}{2}}$. Now, let us try to speak it—one one and a half pitch—a trifle stuttering, though perhaps 'convenient.' He says that the diametral pitch of a gear is the quotient obtained by dividing the diameter of the pitch circle by the number of teeth in the gear; but this last page says that by diametral pitch is meant the number of teeth per inch in the diameter of the pitch circle. This would appear to be another case in which an author has failed to bring his text up to matter taken bodily from a manufacturer's catalogue, as I will presently explain.

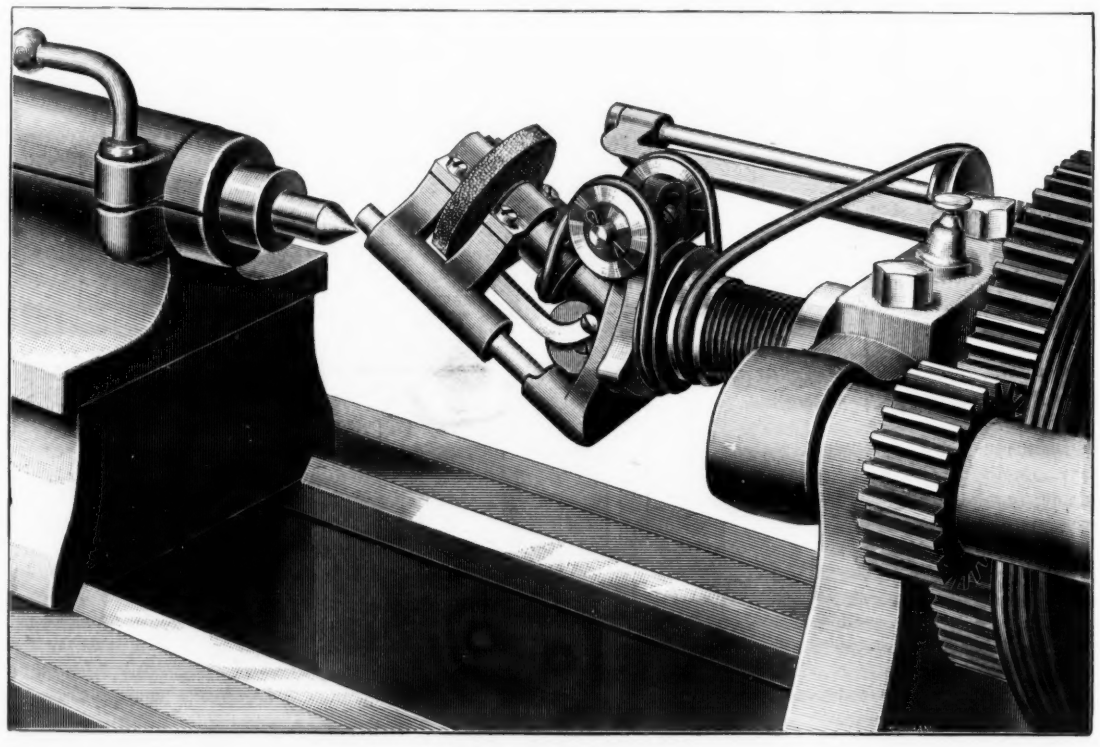
"Let us cut off as many pieces of wire as a gear has teeth, every piece to be of one length, and all the pieces, when put together end to end, to reach just along the diameter of the pitch circle of the gear. One of these lengths can now be taken as a modulus, or unit of measure, in figuring every part of any gear to mesh with this one, or to figure every gear of the same pitch as this one. Now, one of these lengths is one thing, the number of times that one of these lengths can be laid off upon an inch is another thing. One of these lengths would be just the same as it is now, if there were no such thing as an inch in the world.

"Just here is where the confusion begins. This modulus, or one of these lengths, was called by Professor Willis, more than fifty years ago, the *diametral pitch*. Mechanics have found it convenient to use the number of times that this modulus can be laid off upon an inch as a quantity in figuring gearing, and they have termed this number the diametral pitch, which is just the same as on the last page in MacCord's Kinematics. Now, though the original use of this term may be more accurate, yet the mechanics' use of it has come down to us through many years; it has spread into manufacturers' catalogues; it is used in a book on the teeth of gears by the well-known writer, Geo. B. Grant. A treatise on gearing published by Brown & Sharpe Mfg. Co. also follows the mechanics, and, still wanting a term for the modulus, or one of our lengths of wire, has called it *a diameter* pitch: thus, if the diametral pitch is $1\frac{1}{2}$, or one and a half teeth to one inch of the diameter of the pitch circle, then the modulus, or a diameter pitch, is $\frac{2}{3}$ inch.

"In Elements of Machine Design, Part I, page 292, Prof. Unwin says this is confusing. He disregards the usage of mechanics, carries the term diametral pitch back to its original meaning, and the number of teeth to one inch of the diameter of the pitch circle he terms the 'pitch number.' By so doing, Prof. Unwin has added a confusion. To carry out his idea, common usage and most of the gear tooth tables in existence must be changed. This cannot be done by the dictum of any professor, or coterie of scientific men on the earth."

A New Center Grinder.

The accompanying illustration is of a center grinder, which, as will be perceived, differs quite radically from others, and its method of operation is as unique as its construction, both centers being ground in their respective places, and necessarily true and in line with each other.



NEW CENTER GRINDER.

The device is shown by the engraving in position for grinding the foot-stock center. It consists essentially of a plug, which fits the center hole of the spindle, and has fitted to its outer end a plate, to which is secured a second plate, having two studs fixed in it which are parallel with each other, and at an angle of 30° with the center line of the lathe. These studs form the guides upon which a small carriage moves, this carriage carrying the emery wheel which does the grinding. Motion is derived from a supplementary shaft, which is supported by the tool-post and driven from the large step of the cone pulley. From this shaft the double grooved loose pulley shown just in front of the live spindle is driven, this pulley, by means of the two idlers shown, driving the pulley which is on the grinding spindle. On this spindle is a worm which drives a small worm-wheel below, to which is connected the small bent connecting rod shown, which is attached to the emery wheel carriage, thus giving it a reciprocatory motion upon the guides before referred to.

Now, supposing the attachment to be in place as shown, and the lathe started up with back gears in, the entire device revolves slowly with the prolongation of the exact center line of the spindle as its axis of rotation. At the same time the emery wheel will be rapidly revolved upon its own axis and reciprocated. If now the dead center be fed up towards the wheel, it is evident that it will be ground to the correct angle, and precisely in line with the live spindle.

To grind the live center, it is only necessary to place the device in the foot-stock spindle, and arrange to drive the wheel in the same manner, the rotation of the center itself taking the place of the rotation of the grinding device about the center line. It is obvious that centers ground by this device—where any proper degree of attention is given to the operation—must be of the correct angle, and precisely in line with each other. Its inventor, Mr. H. E. Hawes, who is a machinist, is manufacturing it at 143 Centre street, New York City.

Waltham Watch No. 6,000,000.

The American Waltham Watch Company has just completed, ready for delivery, watch movement No. 6,000,000. The event marks an epoch in the history of this concern worthy of more than passing notice. The timepiece is the highest grade nickel movement made by the company, new thin model, 16 size, $\frac{3}{4}$ plate, open face, and has all the latest improvements, including the Church patent pendant settings and stem winding device, and Church's patent micrometric regulator and Logan's patent Breguet hairspring. The train wheels are gold, beautifully polished, and the jewels are the finest red ruby in raised gold settings. The most striking feature is the ornamentation of the plate by one of the company's best damaskeeners, and this work is undoubtedly the most beautiful and elaborate that ever was put on a watch.

The growth of the business of the American company since it commenced the manufacture of watches is well marked by the following figures: Watch No. 1,000,000 was completed in 1877, twenty years after Treasurer Royal E. Robbins purchased the plant. Watch No. 2,000,000 was finished in 1882, and the event was commemorated by the first foremen's supper. Watch No. 3,000,000 was delivered in 1886, and was presented to the Foremen's Association by the company, and it has since been carried by one of the foremen, being drawn by lot at the annual supper. Watch No. 4,000,000 was completed in 1889. Watch No. 5,000,000 was made for Treasurer Robbins and was finished in 1891. From the above it will be seen that it took twenty years to make the first million watches, five years for the second, four years for the third, three years for the fourth, two years for the fifth, and about eighteen months for the sixth. In completing this watch the American company has made one million more watches than any concern in the world.

In such a vast establishment there is constantly in course of construction several hundred thousand watches, and a few days since the movement bearing the significant figures "6,500,000" was commenced.—*Waltham Free Press.*

A hack trust in Chicago is the latest thing to interest the patrons of the World's Fair. Twenty-two dollars a day is to be the price for hack hire. Thirty-five cents paid hack fare within the city limits of Paris during the latest World's Fair there. It is rather apparent that a charge for the same service in Chicago will be about four dollars, unless something is done to check the greed of hackmen.

A Novel Primary Battery.

Mr. C. J. Hubbell is exhibiting a new primary battery in this city. The stumbling-block of all primary batteries heretofore has been their inability to furnish a steady, prolonged current. Mr. Hubbell claims to have obviated this difficulty.

A primary battery is a generator of electricity by means of cells, in which an acid sets up a current by dissolving a metal. Zinc is eaten or burned up, with a residue of sulphate of zinc. In most batteries the deposit of this sulphate on one of the poles of the battery so increases the resistance to the passage of the current that less and less is transmitted, and the whole current is finally cut off. Mr. Hubbell's invention, he claims, removes this difficulty. By a peculiarly constructed battery of clustered cells, polarization is made impossible; that is, the sulphate does not deposit about the pole, and a uniform current is the result. This battery is telescopic. When the covers of the boxes are shut down close the cells are put out of action. On raising the lid the current is instantaneously produced. The higher the lid is raised the greater the strength of the current. At the top of the cells is a neutralizing pad, which permits the battery to be turned upside down without spilling, and oxidizes the fumes, so that the battery furnishing light in a sick room would cause no inconvenience.

The connections are all made underneath the box, and to recharge it is merely necessary to pour out all the old liquid, wash out the battery, and pour in the new chemicals without altering a single connection. Mr. Hubbell claims that this battery will furnish a ten-candle power for ten hours, continuously or at intervals, at a cost of five cents. The zinc will last 140 hours. If the battery is all that is claimed for it, it will be invaluable to miners, who can use it as a lantern in fire-damp with impunity; to firemen, as oil and other combustible lamps frequently cannot survive the thick smoke, where there is not sufficient oxygen to keep them burning; in propelling electric fans, sewing machines, churns, and every household contrivance.—*Chicago Inter-Ocean.*

It is generally considered that those cities in which the water supply is notably impure are in the greatest danger from an epidemic of cholera. The local press will, as a matter of policy, suppress all information until the pestilence or danger of pestilence has passed; then we shall again hear the usual cry against impure water until the danger again approaches. This is worldly wisdom, but it would show a greater display of wisdom if efforts were made to get a better water supply at once. It is parallel to the case of the man who couldn't shingle his house when it rained, while it did not require shingling in dry weather.

A six-year-old boy turned a switch on a western road, wrecking a freight train, just to see some fun.

John Fritz and the Bethlehem Iron Works.

As most of our readers probably know, the Bethlehem Iron Works, which are located at South Bethlehem, Pennsylvania, is one of the establishments which has been brought into great prominence by the recent activity in the building of naval vessels and the construction of armament for them and for coast defense, many of the heaviest tools and appliances having been erected there within the past few years, some of which were constructed by our tool-building establishments who make a specialty of heavy work; some coming from the well known establishment of Whitworth & Co.; some of it coming from Schneider et Cie, of Le Creusöt, France, in whose establishment the manufacture of armor plate has been very highly developed; but the heaviest, including the largest steam hammer in the world, being built at the Bethlehem works from the designs and under the supervision of the superintendent, Mr. John Fritz.

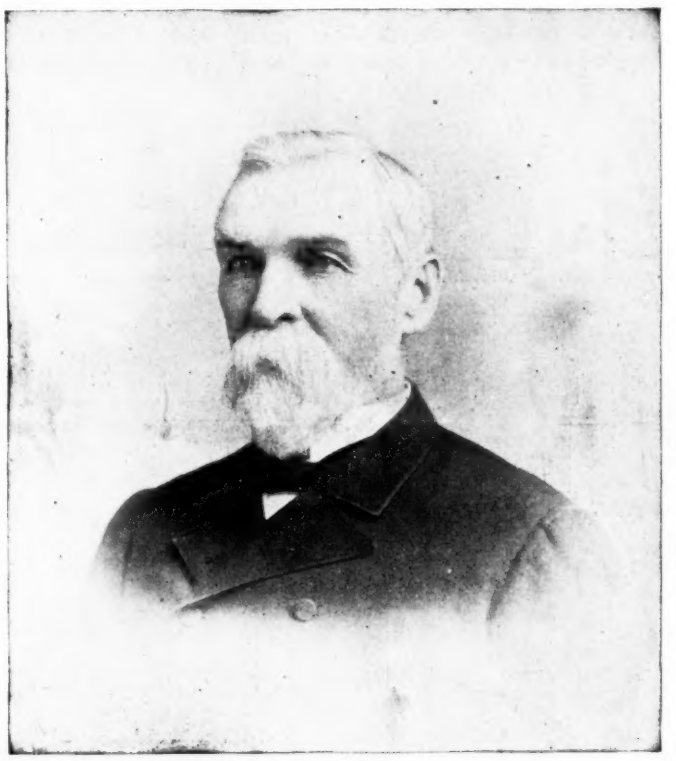
There are very few men of prominence in the world of mechanics and engineering who have more friends or are more popular than is Mr. Fritz. Starting in life something over seventy years ago as a farmer boy, he worked on the farm until old enough to leave home to learn a trade, when his natural bent towards mechanics led him to be apprenticed in a small country shop, such as were common in those times, and in which the art practiced was known as black and whitesmithing. In this shop general blacksmithing was done, and in addition the forgings, after they were made, were sometimes given such finishing as they might require to make some simple machines. Small engines were built, and the shop being located among the iron and coal industries of Pennsylvania, considerable work was done which had to do with furnaces such as were used in those times. Young Fritz was not satisfied to merely do what he was told to do on this work, but studied such matters as presented themselves in connection with it, advancing by reason of this, combined with his inventive and executive ability, to the position which he now holds as mechanical head of one of the largest and best known industrial establishments in the world, which has grown up under his management and supervision. And in doing this he has also done what is perhaps more creditable to him as a man and a citizen, *i. e.*, he has won the sincere respect and very highest regard of all with whom he has been thrown in contact, from the humblest laborer who works under him to the directors of the large corporations with whom his company deals, and the army and naval officials of our own and foreign countries. As a citizen, therefore, and as a neighbor as well as a mechanic, Mr. Fritz is universally honored and respected.

On the 21st of last month Mr. Fritz reached his seventieth birthday, an age at which it is not uncommon for men who have done as much hard work as he, but have been unable to work as calmly and take such philosophical views of life and its affairs, to be more or less completely broken down and unfitted for such work as he is today carrying on, apparently with undiminished vigor, and with far more ease than many younger men seem able to conduct affairs of much less magnitude and importance. On the anniversary above mentioned, some of his friends, fellow members of the American Society of Mechanical Engineers, sent to him a beautifully engrossed and framed testimonial of their high regard and good wishes, the parchment being embellished with symbolic designs illustrating the career of its recipient. Not satisfied with this, they further arranged to give him a complimentary dinner, which was given in Bethlehem the evening of the 28th, and was attended by a very large number of the most prominent and best known manufacturers, engineers and mechanics from all parts of the country. The next day—the 29th—the visitors were conducted through the works, where, of course, they saw many interesting sights and operations.

The works of the Bethlehem Iron Company are located on the south bank of the Lehigh River, the buildings being of the most substantial character—brick and stone, with slate roofs. The number of men employed here is from 3,600 to 4,000, and finished articles in steel, such as steel rails, structural beams, the forgings for guns and armor plates are turned out in large quantities from the ore.

The rail-mill is much the same as is to be seen in several other places, four Bessemer converters being used, the products of which are handled by a hydraulic crane about which are grouped the pits which contain the ingot molds for 15″ ingots. When these are partially cooled they are taken out of the molds and re-heated, after which they are rolled out into square bars and cut up under a steam hammer into lengths suitable for making a rail. They are again re-heated and pass to the rail-mill which forms the rails, and from which they are handled almost exclusively by machinery until ready for shipment.

Ingots for armor plate must, by requirement of the government, be cast three times the thickness of the finished plates at least, the ultimate thickness being obtained by the subsequent forging processes, which are here done by hammers and hydraulic presses of the most gigantic proportions. It is on this work and on forgings for guns that the largest hammer in the world is used, the weight of the falling parts in this hammer being 125 tons, and steam can be used on top of the piston to increase the force of the blow if desired, though this has not been required by any work yet done there.



JOHN FRITZ.

Government work, which, in its finished form, is to be round, such, for instance, as the parts of guns, is required to be cast in a round ingot, and these are made here up to 4 feet in diameter, and 8 or 10 feet long. They are then bored centrally in what are called ingot mills, the ingot being chucked in what resembles more than anything else, perhaps, the driving chuck of a double ended axle lathe. Drills and boring bars are then fed into them from each end by hydraulic pressure, and they are thus bored out, after which they are cut into suitable lengths and forged on arbors, this treatment insuring much greater uniformity and more homogeneous metal than would be possible by forging in a solid mass, and then boring. Some very excellent results have been obtained here in this way, especially where the greatest possible strength, combined with the minimum weight, is important.

Most of the tools used here are exceptionally heavy, and in the armor plate department, mostly special in character, planers being used, for instance, in which the pit in the center in which the plate is placed is the most prominent part of the machine, this pit being large enough to take in the plate in any desired position—flat or edgewise—to be operated upon by tools which are moved over it, and are supported upon cross-rails, which are in turn supported by housings which are reciprocated by large screws at each side of the machine, the plate being held stationary. There are some sawing machines whose office it is to trim a plate into shape by sawing off strips from the edges. These are from the Schneider establishment in France, and make use of saws which are about 4 feet diameter and half inch thick, having inserted teeth, which are held in place by wedges, and resemble the ordinary square-nose tool, with rounded corners. The head which supports the saw arbor travels along the bed of the machine, being moved by the feed-screw, which seems to be too far from the saw to be called a first-class design, the contrast in this respect between these machines and a new rotary planer, by William Sellers & Co., recently put in, being very apparent, the feed-screw in this case being as close to the head which carries the tools as it can possibly be placed. This rotary planer is to be used for trimming the edges of plates. All the cutting operations have to be done at very slow speeds, for the material is extremely hard and difficult to work.

The machine shop in which the gun and other forgings are finished is one of the most remarkable shops in the country. It is 1,200 feet long, about 150 feet wide, has both a narrow and a standard gauge track passing through it at the floor level, and traveling cranes operated by compressed air overhead. Only about half the length of this shop is now in use, the other half being a new addition just fairly completed, and in which the tools are not yet in place. This has been necessitated by the work, recently undertaken, of building finished guns, and all the additional room will be required for this. Among the heavy tools going in here is a 72″ planer, by William Sellers & Co., for which the foundation is in place.

An excellent idea of the magnificent scale on which operations are carried on here may be obtained by witnessing the operation of tempering a gun tube. A plant has been put down for this, which is capable of tempering a tube 60 feet long. The building in which this is done is high enough to allow of a traveling crane overhead, the clear lift of which is somewhat over 120 feet from the floor. At one side stands a vertical cylindrical furnace 60 feet high, with a system of pipes around it with valves, through which is supplied gas made from anthracite coal. This gas, mixed with the proper proportion of air just as it enters the furnace, is introduced to the furnace in jets from top to bottom, and all around it; and the tube stands or is suspended vertically in the center, having been placed there by the overhead crane previously referred to. When properly heated, the tube is lifted out of the furnace and carried by the crane over a cylindrical tank 60 feet high and about 10 feet diameter, which is filled with oil, into which the tube is lowered, the flaming oil, ignited by the hot tube, forming a most magnificent torch as it issues from the bore at the top. A supplementary tank outside the building, with proper system of pipes and a pump, keep the oil in circulation, and give it opportunity to conduct away the heat from the tube. Altogether these works form a most interesting place to the mechanic, though a thorough inspection of them is not made without certain restrictions, especially with respect to publication of descriptions of operations carried on there.

We have received the following communication, which we gladly make room for. It will explain itself so fully that there seems no room for comment.

Knowing that you are interested in every suggestion or improvement that can be made in the way of mechanical pursuits, therefore would suggest to you, as there are a great many young men throughout the South who would like to take lessons in mechanical drawing, but are not able to go a long distance from home, or to the more expensive schools of the North, that if some competent man, who is capable of teaching mechanical drawing and engineering, would come here, I believe that he could build up a good school in a short time.

If you have no objection to making a note of this in your paper, will say I would be pleased to correspond with any one who would like to get further information on the subject, and cheerfully give him any assistance I can. Should be glad to hear from you regarding same, if not troubling you too much. I have no special personal interest in this matter, but think it would be of great benefit to many of our young men who are anxious to improve themselves, but have not the means or opportunity, and as Winston Salem is one of the most progressive towns in the South, and fast becoming the principal railroad center between Richmond and Atlanta, would suggest that this would be an excellent opening for some man to start up such a school, and, as winter is approaching, would suggest now would be the time to begin. C. A. HEGE.

Salem Iron Works, Salem, N. C.

Cogging Wheels—V.

BY JOSEPH HORNER.

(*For Cuts see page* 6.)

The cogs for mortise wheels are only marked out each one separately and cut with hand saw, when there is, as in some very small country shops, no circular saw available; or when a few new teeth have to be inserted in an old wheel. In most cases the cogs are cut in a template block over a circular saw, in the following or some modified method:

The stuff for the teeth is first sawn out into a cubical form, Fig 29. There are then eight several cuts required to bring these blocks into the form or condition, Fig. 30, ready for driving into the mortises. There are four cuts for the shank *A* and four for the shoulders *B*. These may be wholly cut with the circular saw. Or, as is perhaps more frequently done, the shank cuts only are done with the circular, and the shoulders by other means; as by hand, or tenon saw, or band saw.

Since it is desirable to cut the shanks of the cogs to as nearly as possible the size required to fit properly within the mortises, mere measurement of the mortises is not sufficient to insure accuracy; but first templates or patterns, Fig. 31, are fitted into a mortise, both lengthwise and widthwise, and also tried into several mortises to see if it will make a fair fit in all; for although the mortise cores are all made from one box, they may probably not all be alike in size, because of unequal rapping of the box, sleeking the core, and blackening. It would never do to

cut all the cogs to measurement, and then find out that several of them made slack fits with the mortises. Neither, on the other hand, is it desirable to have an excess of wood to be taken off the shanks with rebate plane and chisel, because that means a waste of time. When, therefore, templates like Fig. 31 are made to a fair driving fit with the mortises, these give exact dimensions for sawing the whole of the cogs at once, without fear of a slack fit on the one hand, or a tight fit on the other occurring. The cogs are not, however, sawn just neat to the template sizes, but a little full, because for a perfect fit the shanks must be smoothed with a rebate plane; but they are sawn so closely to size that the allowance for planing is not more than about $\frac{1}{64}''$, barely sufficient to allow of the plane removing the whole of the saw marks.

In repetition work of this kind all the sawing in one direction is done at once; then that in another, and so on, to save time. The first series of cuts, therefore, is taken down one face only of a shank, as in Fig. 32 *A*. This is done in a block like Fig. 33. The block is cut out to receive the cubical pieces of wood which are prepared for the cogs. The outside dimensions of the block are not of importance. It should be long enough to slide steadily along the table of the circular saw. The length *A* of the recess is such as to allow of a free fit of the cog within it. The important points are the height *B* of the bottom of the recess from the table, and the slope of the inner face *C*. The depth *B* to the bottom is such in relation to the height of the circular saw and the intended length of the shank, that when the end of the shank rests upon the bottom the top of the saw, shown dotted at *D*, will cut exactly up to the shoulder *E* of the cog, Fig. 32; that is along the line *E* in Fig. 33, so that even if the pieces which are sawn out for the tooth vary $\frac{1}{8}''$ or $\frac{1}{4}''$ in length, their *shanks* will all be sawn of the same length by means of this block, and any excess of wood will be left upon the end of the *tooth*, to be turned off after the cogs are fixed in place. The shanks will thus have a neat, regular appearance within the rim of the wheel, as indeed they should have.

Then the slope of the inner face *C* is such that when the blocks lie close against it the vertical circular saw will cut one face of the shank at the proper bevel *A*, Fig 32, which is equal in amount to one-half the total taper of the tooth shank.

The block itself is kept always in one position in relation to the saw by means of the adjustable fence usually fitted to the saw bench. In Fig. 34 *A* is the fence, *B* the block, *C* the plane of the saw, and *D* the cog, so that on every cog the first cut will be at a certain distance away from face *C* (compare with previous figure), and any excess of wood due to difference in thickness of the planks from which the cogs were cut will always be on side *a*. The saw cut will always stand at a uniform bevel, and will always reach to a certain depth from the end of the shank, which matters are insured by the employment of the template block *B* and the use of the fence.

The shoulder *b*, Fig. 32, is to be cut next. This may be sawn either with tenon saw, hand saw, band saw, or circular. A tenon saw is too slow in operation, except on very small teeth; a common hand saw with little set and little rake is much better. A band saw is better still, the tooth being stood on one edge upon the table. The quickest and best way when quantities are being done is shown in Fig. 35. Two blocks, *B* and *C*, of the proper height to allow the upper part of the circular saw to cut into the precise depth to meet the cut that has just been taken along the shank face, are fixed upon the saw bench upon each side of the saw. The block *B* is rebated, or has a strip screwed upon it to bring the shoulder cut *b* at the right distance from the end of the shank, and it bears against the fence *A*. If, however, the fence is high enough, the rebate can be dispensed with, and the end *c* of the tooth shank itself bear against the fence, whose face is then set at a distance equal to the length of the shank from the circular saw; the cog being slid along, therefore, upon the fixed blocks *B* and *C*, the saw cuts the shoulder *b* to the right depth, and at the correct distance away from the end *c* of the shank. Details of the method of rigging up the blocks may differ. In the figure the blocks *B* and *C* are kept at a certain distance apart, in order to clear the saw, by means of thickness pieces, and the two are held together with screws run in positions beyond the diameter of the points of the saw teeth. The block *C* might be dispensed with entirely, but it is safer to have it there.

The face and shoulder cut thus become the working faces from which the other face of the shank is cut. The template block *B*, used for cutting the second face, is shown in Fig. 36. Its height *E* is also just equal to the height of the saw from the table, and the bevel of the inner face *b* is equal to the total taper of the tooth shank. So when the cog *D* is placed upon and in the block as shown, the saw *C* cuts the second face of the shank to the correct taper with the first, and to the exact depth for the shoulder *d*. The shoulder *d* is afterwards sawn by either of the methods made use of for the first shoulder; by hand, band or circular saw, as before explained.

The ends of the shanks and their shoulders have now to be cut. A template, Fig. 37 *A*, is cut of thin wood and laid upon one face of the shank, and lines scribed down the edges *e e*. The ends of the shanks are afterwards sawn, and shouldered at *a a* without the use

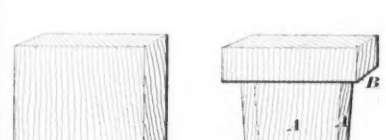


Fig. 29.

Fig. 30.

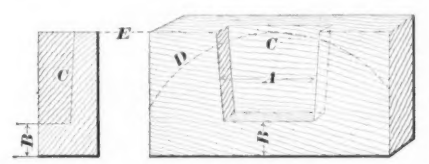


Fig. 33.

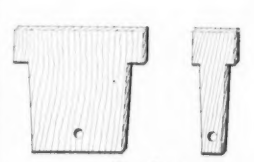


Fig. 31.

Fig. 32.

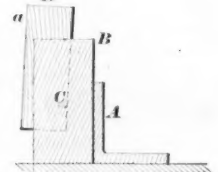


Fig. 34.

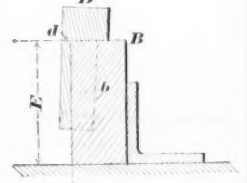


Fig. 36.

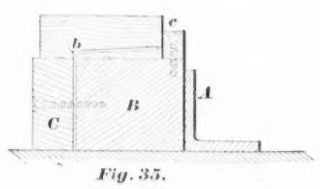


Fig. 35.

Fig. 37.

Fig. 38.

Fig. 39.

Cogging Wheels.—See Page 5.

of template blocks, by whatever means happen to be most convenient. Often they are cut only with hand saw, the thickness of the shank being so very little. Or they may be cut with circular saw and shouldered with hand saw. Or they may be both cut and shouldered with a band saw.

Having described in detail one method of sawing cogs, I will just say that this precise sequence of operations is not always followed. Frequently the portions we have cut last are cut first. Thus a template like Fig. 38 is made and laid upon the roughly sawn blocks, and the edges scribed round and sawn with hand or band saw. The faces of the shanks are afterwards cut in template blocks like Figs. 34, 35, 36, whose recesses are modified to receive the shanks. Otherwise the method of sawing with the guidance of the fence and the top of the saw remains the same. Or when cutting by hand entirely the faces of the shanks are cut first, being marked by means of a template like that shown in Fig. 39, laid on the ends of the cogs. After the faces are sawn then the ends are marked for cutting, in the way shown in Fig. 37.

Bevel wheel cogs are sawn by essentially the same methods as the cogs of spur wheels, the template blocks being shaped to suit the beveled forms required.

The police have arrested the workmen in a glue factory at Newtown Creek, L. I., because the factory is declared a nuisance. Why not arrest the proprietors?

LETTERS FROM PRACTICAL MEN.

"Short Talks to the Boys."

Editor American Machinist:

Under this head "Practical Machinist" advises boys not to go tramping, though he slightly qualifies his advice by reference to a hypothetical case of a boy who has only partly served his time.

Undoubtedly some natures are unfitted for moving from their original home, but others are differently coustituted and must tramp for some time before settling down. I know of nothing more pitiable than the sight of a fairly good man who has spent a lifetime in one spot and who by some chance has to begin at 40 years of age to tramp and learn what he should have learned when young—how to accommodate himself to fresh surroundings—without which faculty even skill will frequently avail him but little.

What necessity is there even for a man who has become used to roving to lose his ambition?

That roving has been for centuries regarded as one of the conditions necessary in a good workman is very clearly indicated by the term journeymen, applied to craftsmen who had passed the stage of apprenticeship, while the craftsman may be said to have been raised to a higher degree when he became able to settle down, as finally he would do, and I fancy that a census of the heads of departments in every branch of engineering and mechanics would reveal the fact that they had all been, in a sense, on the tramp – a process which broadens the mind and widens one's views of life, and, though an expensive process, it is one which perhaps oftener than not results in a good return for capital invested.

My own personal experience of other lands, acquired in tramping, is such that I should be sorry to part with the knowledge acquired; without actual residence in a locality or amongst foreigners it is impossible to acquire a knowledge of methods, or to intelligently read their publications. No untraveled European, for example, could intelligently read an American paper so as to acquire a rational knowledge of let us say the position of a man earning $10 as compared with that of a man earning say 30 francs in the same time; nor, on the other hand, could the American arrive at a proper estimate of the European from the published figures in a European paper. There is no need that the man of roving disposition should stay so short a time in one place as "Practical Machinist" seems to indicate. He may stay anywhere up to three or four years, and the chances are that some day he will awake to the fact that he has become rooted, and the conviction will grow upon him that he has done his share of journeying. I have known many such men, and they always seem to have settled at last on a good broad base, and no reports of the wonderful things to be done elsewhere take much hold on them; they have been through the process and found it all out. I have learned one thing or have unlearned one thing which is as well to be recognized by everybody, and yet which is strangely misunderstood. In my younger days every one was calling out loudly for less occupied fields, and the colonies were held up as the proper sphere of action, where each man had about a dozen square miles to distribute himself over. Young and old alike suffered from this false view of economics, and the prevailing impression was that the fewer the inhabitants the better the chances of a new comer. Now I am not prepared to deny that some few do appear to have done really better than one would have expected of them at home, but were I called on to get a living by selling nails I would now try and find that street where sellers of nails were thickest, rather than hang out my shingle where no one had yet found it worth while to do the same; but by home in the above sentence I mean my native land, and would never advise any boy to stay right at home where he was raised, for he will be a boy just so long as those of his elders remain to remind him how he looked when he had measles, or as one Wilson once reminded me how he had carried home the silken tile my father was married in, and so on until he curses their confounded long memories and their waggling jaws. Tramp, then, by all means; stay in each new location long enough to make friends, and don't leave it unreasoningly. If you have a run of bad luck in a place shake off its dust and go elsewhere. Nothing is so bad as a run of ill success when you feel you have deserved better. If you are a stranger in a place and follow out the principle of taking hold of the first thing which offers, it may be you will at some time unwittingly become connected with affairs that a better knowledge would have enabled you to avoid, and this may spoil your chances entirely in that town, or you may think it has done, which comes to the same thing, for it takes some of your confidence away. Never stay long enough in a place out of employment to get a character as a loafer. You may be perfectly innocent of loafing, and be doing all you can to find a place, but if unsuccessful you will soon find out that you must make a move, however averse you may be to doing so. I maintain that one who tramps with discrimination is by no means the lost soul that a "Practical Machinist" pictures. It took years of adverse experience to drive me to the locality in which I now find myself—a locality which I always avoided, and to which I never gave a thought as a place of settlement, and yet one to which I now have clung against strong financial reasons to remove.

Never be discouraged by the dictum of an older man. The item which sent me on the tramp was the statement by my then employer that he did not consider a man worth anything until he had been thirty years in the business. Seeing that there was before my eyes a man of 42, who had been reduced in pay for old age after twenty-five years' service in the firm, the valuable prospect thirty years ahead seemed to lose some of its gilding. The fact formed a sufficient inducement to give me that send-off which eventuated in several years of movement, and gave a more or less valid excuse to some, who should have been my friends, to shake their heads in a wiseacre sort of manner and refer to me as

A Rolling Stone.

P. S.—Let no one take the foregoing as a recommendation to tramp. Tramping involves so much hardship, and may require greater perseverance than is in some who might go tramping on my advice, that I should regret to be the cause of sending any boy on the tramp. Still, if compelled to move, my advice is do not despair of success. Your settlement will come when and where you least expect it.

Lubricating a Grindstone.

Editor American Machinist:

I have got a *big thing*, and *must* give it away.

My grindstone, 36″x2″, got badly out of shape, one hole on one side $\frac{3}{8}''$ deep. I tried most every way of truing that stone, but turning; couldn't do *that;* the dust would spoil more machinery than a new stone would

cost. I tried the gear wheel device, but the set up screws *would* get rusty. One morning I was putting some tallow in the boxes of my engine (I always *oil* them that way), and the thought struck me to rub some tallow in that hole in the grindstone. At night I noticed the spot covered with a black glaze; put more tallow on next day. Result, tallow once a day for one month, true round stone, no dust, no noise, and a knowledge of how to true up a grindstone.

LE ROY TOBEY.

Radial Drill with Table.

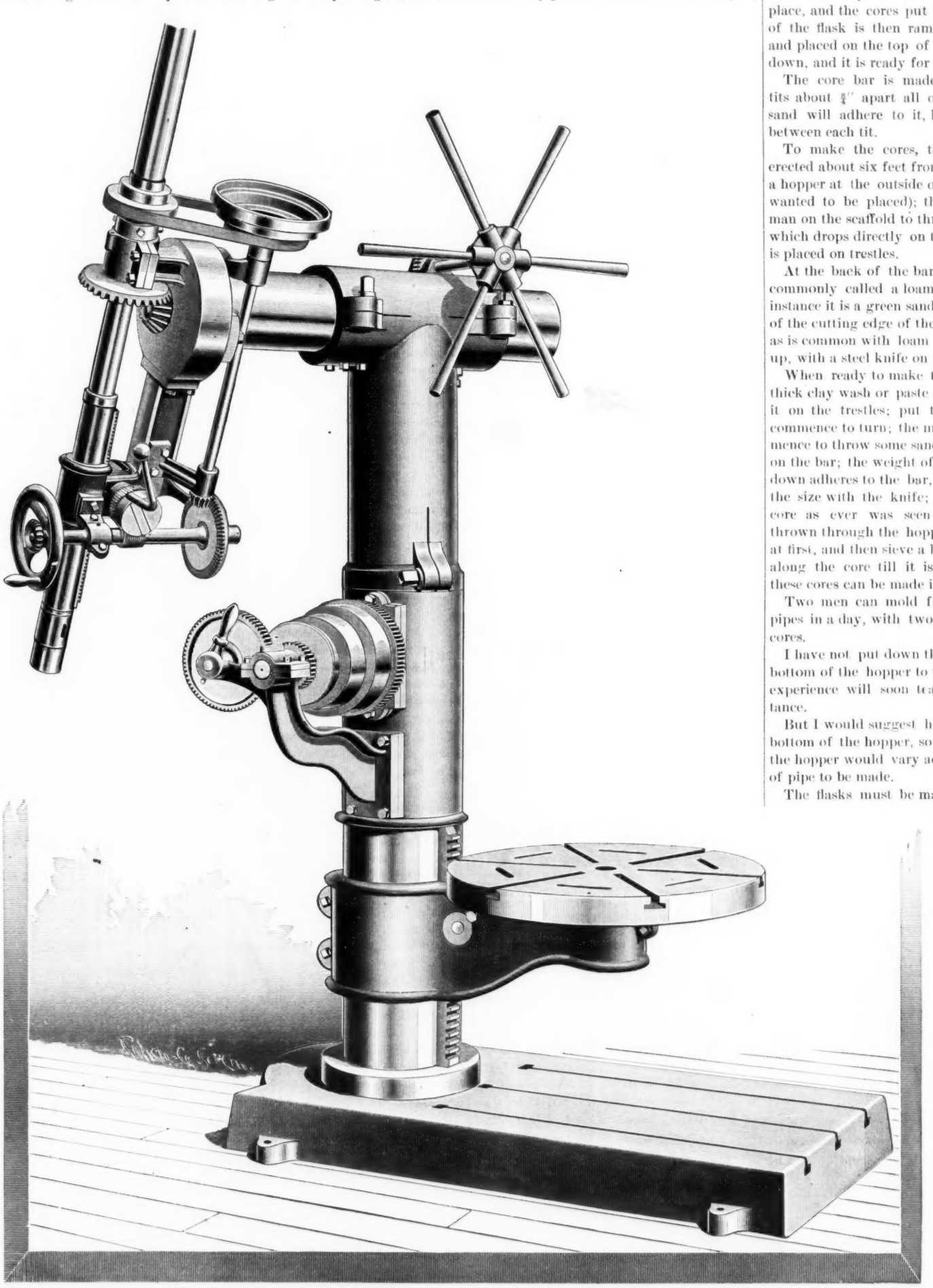
We illustrate herewith a universal radial drill, which has been designed for general machine shop and similar uses by its builders, the McNaull Machine and Foundry Co., Ronceverte, W. Va.

The bed-plate of the machine is made deep enough to secure rigidity, provided with three T-slots, and to it is firmly secured the column, which is 10″ diameter, and carries the arm which supports the table in the usual manner.

The upper portion of this column is turned for 20″, to form a bearing for the T which revolves upon it, may be clamped in any desired position, and carries at the top the traveling arm, which, as shown, is cylindrical, and can be clamped at both ends of the T, in which it does not revolve, but is traversed back and forth to suit the requirements of the work by means of the rack and pinion movement shown. Fitted to a flange at the end of this column is a plate which swivels, is graduated, and can be clamped at any desired angle. This carries the bearings for the spindle, which has the usual sleeve, with automatic and hand-feeds and quick return motion.

A vertical shaft driven by bevel gears passes up through the center of the column, and through a slot in the lower side of the arm, where by bevel gears it drives the horizontal shaft in the arm. The head may be revolved the entire circle, *i. e.*, it can be placed to drill in any desired direction, from vertically upwards to vertically downwards, without stopping the machine, and the arm never extends further than is required by the work in hand, and is never in the way of the workman when standing in front of the machine.

The total height of the machine is 8 feet; it drills to the center of a circle 60″ diameter and has 20″ traverse of spindle. Greatest distance from bed-plate to end of spindle, 45″, and from the floor, 50″. Spindle is 1¾″ diameter, with No. 4 Morse taper socket; cone is for a 2½″ belt; floor space required for base 30″x60″; weight, about 3,000 lbs.



RADIAL DRILL WITH TABLE.

The exultation indulged in by some daily papers because a good many foreign workmen are out of work is about as senseless as anything we have seen. If we want to sell goods in Europe it is altogether in our interest that workmen there be employed all the time. That is what gives a country money to buy with.

A good deal of stir is being made in Jersey City about the car service, it being claimed that in its deficiency it bars progress in the way of settling the hill districts. This is the case in a good many cities.

Answer to an Inquiry as to the Best Way to Make Soil Pipe.

In answer to Albion's inquiry as to the method of making tubes similar to soil pipe, in your issue of September 1st, I will try and describe the way of making them that is in vogue at the present time.

In the first place, we must find out the size of the pipe to be made, whether 1″, 2″, 3″ or 4″; if either one of these sizes they can be made in one flask, but if larger size I would advocate the making of them one in a flask (that is, in green sand). I believe that they are made up to 8″ in a regular pipe foundry, two in a flask.

Then, after we know the size of the pipe, we will get a follow board made for a 3″ pipe, for instance, that is two in a flask; this board is made so that the patterns will be half way in the board; they can be made in halves, if desired; if in halves, they must be a little over the half, so as to leave a little for a slide up and down in the board. But I think that it would be better to make them whole.

The flasks are made with a turn plate, that is, the pin holes, so that either one will fit the other. When the flask is rammed up and the patterns are dropped down clear of the mold, that would be about ½″; the flask is then lifted up, turned over, and put in its place, and the cores put in; the other piece of the flask is then rammed up, lifted off, and placed on the top of the other, clamped down, and it is ready for casting.

The core bar is made of cast-iron, with tits about ¾″ apart all over it, so that the sand will adhere to it, likewise vent holes between each tit.

To make the cores, there is a platform erected about six feet from the ground, with a hopper at the outside of it (or where it is wanted to be placed); this hopper is for a man on the scaffold to throw the sand down, which drops directly on the core bar, which is placed on trestles.

At the back of the bar is placed a board, commonly called a loam board, but in this instance it is a green sand board; but instead of the cutting edge of the board being down, as is common with loam boards, it is placed up, with a steel knife on the top edge.

When ready to make the cores, put some thick clay wash or paste on the bar, and put it on the trestles; put the handle on, and commence to turn; the man above will commence to throw some sand down the hopper on the bar; the weight of the sand dropping down adheres to the bar, and it is cut off to the size with the knife; it makes as nice a core as ever was seen; the sand can be thrown through the hopper with the shovel at first, and then sieve a little fine sand down along the core till it is up flush. One of these cores can be made in about one minute.

Two men can mold from sixty to eighty pipes in a day, with two others to make the cores.

I have not put down the distance from the bottom of the hopper to the bar, but a little experience will soon teach the proper distance.

But I would suggest having a slide in the bottom of the hopper, so that the mouth of the hopper would vary according to the size of pipe to be made.

The flasks must be made as light and as strong as possible, as they will have to stand some rough usage, and I would suggest, in place of casting the handles in them, that they be cast with two 1¼″ holes in each end, so that loose handles can be used, and then the flasks will take up about a foot less room than with handles cast in or on them.

It must be borne in mind that the tits on the core bar must not exceed ½″ in length, and allow for ¼″ of sand over them—that is, the core bar—over all in diameter must be ½″ less than the size of pipe to be made, inside measurement.

THOS. WATHEY.

Cleveland, O.

Nothing in mechanics is more remarkable than the progress of the last few years in metal turning machinery. Old processes have been put one side, and new processes have been brought out; but after all the engine lathe is the ideal machine in the machine shop, and will always remain so. It will be displaced here and there, but will always be at the front.

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The Coal Combine.

The roads which have combined with the Reading to control the mining and transportation of anthracite coal have come into conflict with the laws and authorities of several States, and in every instance so far, we believe, they have been defeated. It seems to be probable that the State of New York will be added to the list, the special senate committee appointed to investigate the matter of the combination having rendered a report, in which it declares its belief that the "combine" is illegal, and advises that such action as the jurisdiction of the State will allow be taken by the Attorney-General against it. Only one of the companies concerned—the Lehigh Valley—is incorporated under the law of this State, but it is thought that some of the others can be reached through leased lines, and it is not improbable, in view of the report, that something effective may be done. As time goes on, and one step after another is taken, it seems likely that, if the combination pulls through at all, it will be so weakened by the many attacks upon it, and the modifications made necessary by them, that it will be very liable to go to pieces entirely whenever it becomes to the interest of any prominent member of it to withdraw or to ignore its terms. In the meantime, however, some few men have won some millions of dollars on Wall street by dealing in the stocks of the roads concerned, and the same men or possibly others will be apt to win more when the end approaches, the people in the meantime paying the fiddler in the form of augmented coal bills.

"The Lack of Work."

Though we are well aware that our readers, whether they all fully realize it or not, are interested in the social problem, it does not follow from this that we can enter into discussions of this problem; because our readers, we take it, look to us for their reading matter pertaining to machinery, and go elsewhere for their reading in relation to social problems. Naturally, however, in commenting upon current matters of interest to mechanics, the fact that there is a social question plainly appears; and our object is not to teach social economy, but to induce conscientious and careful thought upon the subject so far as practicable. Strictly in line with this is the following letter, which we have received from the well-known mechanic and engineer, Mr. Hugo Bilgram, who says:

Your editorial on "The Lack of Work" is a timely suggestion to producers to use every effort towards finding the correct and specific answer to the question, What is it that causes the "lack of work"; why is the work actually done less than that which producers are able and willing to do? This question is no doubt the nucleus of the social problem, and since the teachers of political economy fail to answer it, it remains for the producers, as the most interested parties, to attempt this task, and, if a rational answer is found, to insist upon a removal of the impediment.

By the term producers, in the above, Mr. Bilgram does not, of course, mean, what often is meant by the term, those who work with the hands only, but includes all those who perform useful labor of any kind, either mental or manual. It is undoubtedly true, as he says, that these are the most interested in the proper solution of the question. Not all producers, however, have the taste or the ability to study such matters deeply, as Mr. Bilgram has done, but we hope and believe that the time is coming when most of them will at least realize that, so long as there are men who are willing and physically able to perform useful labor, but who cannot find work, or, finding it, cannot receive therefor sufficient remuneration for the comfortable maintenance of a family, there is a social problem which presses for solution. And this must apply not only to the most skilled workers, but to common laborers as well, for it is undoubtedly true that the real prosperity of the entire people of a country is measured by the prosperity of those on the lowest round of the ladder. We believe that when men generally really begin to think on these matters the solution will not be far off, but no solution is possible so long as any great proportion, or the majority of men, regard as a crank any one who attempts a solution, no matter how sincere his labors may be.

In matters pertaining to machinery, to manufacturing, and to all problems connected with shops, our readers are familiar with the fact that thinking brains are more potent than brute force. We all know that when something is to be accomplished in a mechanical way that has not been accomplished before, the first thing to do is to sit down and think over it, and think hard. If competition presses too closely, most of us understand that the best chance of meeting it is not by putting forth more brute force, but by thinking out some improvement in processes. It must be the same with social and public questions. We may and must restore order when disorder arises, and force is usually necessary for this; but the causes which lead to disorder can be removed only by means which must be the result of intelligent, unprejudiced and patriotic thought and study. Because we have an excellent machine—the best of its kind, perhaps—is no proof that it cannot have faults or cannot be improved upon, or that it may not need modification to meet different conditions. It is and must be the same with social structures.

As to what Mr. Bilgram says about the teachers of political economy having failed to answer the important question, not everybody will agree with him on this point, for there are many who believe that the question has been satisfactorily answered. Mr. Bilgram himself, having studied upon the problem, has given his answer and published it in a book which we have noticed. He, of course, believes that his is a satisfactory answer, and there are those who agree with him. But others have given their solutions, which are also published in books, and these also have their adherents. Possibly none of them have given the correct solution, but again possibly some one of them has given it; but at any rate the solution, when it appears, will be in the form of a book—the result of thinking, not in the form of a bludgeon or a gun. So, while this journal is devoted to another line of thought and discussion, we advise those who would have an opinion upon social matters, or who would criticise the thoughts of others, to first study and think for themselves, and not blindly accept the conclusions of others.

Courtesy as an Investment.

The *Railroad Gazette* has a timely editorial on the above subject, and shows the difference in the effects produced upon the minds of travelers by the different treatment given them at terminal stations by different roads. On some roads any parts of the station buildings which are intended for the use of passengers are accessible to them at all times, and men are there whose business it is to see that patrons of the road are given every necessary direction and facility to find the right trains and get comfortably settled in them before starting time. And there is no examination and punching of tickets, either; it is assumed apparently that people who travel know enough to find their trains if given decent facilities for so doing in the way of guide boards, bulletins and criers, and that they intend to pay their fare.

With other roads the case seems to be entirely different. Doors or gates are kept carefully locked, preventing all access to the trains until within a very few moments of leaving time, no matter how large may be the crowd in waiting, and then every ticket has to be carefully scrutinized and punched as the passengers pass in single file, as though it were assumed that few of them could know what to do if left to themselves or could be trusted to procure tickets before entering the trains; and the whole matter is conducted in a way that is exasperating and well calculated to put the traveler in a mood to curse the road and all its belongings. The direct cost of the more courteous way may be greater, but we think that in the end it pays best. People, even when in crowds, prefer to be treated like sentient human beings, and object to being "handled" like cattle, horses, hogs or other live stock.

The Singer sewing machine works has again been visited by a disastrous fire, which occurred the morning of the 28th and burned out the cabinet, carpenter and pattern shops. The loss is estimated to be about $150,000. Among the losses are those of a number of pattern makers whose tools were destroyed. It was not found necessary to stop the factory on account of the fire, and so of the 4,000 employes only those who worked in the burned portions of the buildings will be much affected. The company is, of course, fully insured, but it is reported that of the fourteen pattern makers and eight cabinet makers who lost their tools only two were insured. It would seem to be a matter of ordinary prudence that mechanics who have valuable tools in a shop should secure protection upon them, but we believe that where they seek to do so they find the rate of premiums asked out of all proportion to those paid by the owners of the shop, though it is evident that the risk is essentially the same. Some plan whereby the company owning a shop could include in its insurance policies the tools of its workmen would seem to be a good thing. Such insurance would increase the premiums very little, and if the company did not feel like paying the increased cost the men could well afford to do it rather than assume risks of fire themselves.

On the day that this paper reaches the majority of our readers the emery wheel manufacturers are to hold a meeting in New York City, which is, among other things, liable to result in advancing the price of emery wheels, as the manufacturers say their goods are now, many of them, down to cost, owing to the cut-throat competition that has been prevailing. Among other subjects of importance to the interests of emery wheel manufacturers that will be considered at the meeting, is that of reforming some of the vicious methods of selling which have prevailed in that line of business, such, for instance, as giving buyers from six to eighteen months time on their purchases, with the privilege of sending back the goods if they think they do not like them. Whatever may be the result of the deliberations of the meeting, we think the interest of the emery wheel user will be best served, in the long run, by paying a fair and stable price for the emery wheels he uses, conditioned on good quality and reasonable methods of selling.

Learning a Trade.

Being without anybody to advise me, I thought best to ask some reliable party. I will be 22 years of age December 30, 1892. I am desirous of learning a trade; but having had to earn my own living at an early age I had to work where I received the most money; therefore I didn't have the chance for a trade there. I have always been a clerk (also postal clerk); but I would rather work with my hands than with my brain. Now I have saved about $300. I thought if I apprenticed myself to a friend in his machine shop—having now two apprentices—that there is still a chance, and that I could learn the trade of machinist going through the regular routine and paying the balance to my salary from my $300 for board, etc., for three years. Is the trade worth paying out this amount and trouble, for I want either the trade or the $300. I can't afford to lose both. Could I learn it in three years? If not in three years, could I secure a position in some shop where I could earn a living, and continue? How long does it take to become a good machinist, or is the trade as good still, or is it becoming crowded, like the lawyer's profession? How does the pay vary for machinists? Please answer as soon as convenient, as I have communicated with this party in regard to engaging.

The foregoing has been received from a correspondent. He presents questions that are hard to answer. We do not know anything regarding the ability of our correspondent to learn the machinist trade. It is a good trade for those who master it. It will never be overcrowded for those who can climb to the top. It will always be overcrowded for those who stay at the bottom. It seems to be the general opinion that a man can learn a trade, and make a success of plying it, without much effort. Nothing could be farther from the truth. If a young man is to become a good mechanic he must make

up his mind to work just as hard to that end as the lawyer or the doctor works to the end of making himself competent. Regarding the three hundred dollars our correspondent speaks of, without feeling competent to give much advice in financial matters, the savings bank seems the best place for it. A determination to live within his income will get him through his apprenticeship, and the three hundred dollars will have increased itself by the addition of the moderate interest allowed. We can only indicate a course that comes from actual experience, and in conclusion say that in our opinion there is no trade greater than that of the machinist.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(420) F. W. R., Fredonia, Ill., writes: Please answer the following questions in the AMERICAN MACHINIST: 1. Can solid boxes be babbitted without the use of a tapered plug? If so, how? *A.*—Yes; see our issues of August 13, September 10 and September 17, 1891. 2. What lubricant is used in the cylinders of gas engines? *A.*—Good refined mineral oils will answer the purpose.

(421) R. J. R., Oil City, Pa., writes: Please state how to ascertain the proper diameter of dash-pots for Corliss engines. *A.*—The area for the vacuum chamber of a dash-pot for a Corliss engine is from 4 to 5 per cent. of the cylinder area; the area for the cushioning chamber of the dash-pot is from 12 to 15 per cent. of the cylinder area. The strength of the vacuum, as well as the amount of cushioning, is generally controlled by a valve or cock to suit circumstances.

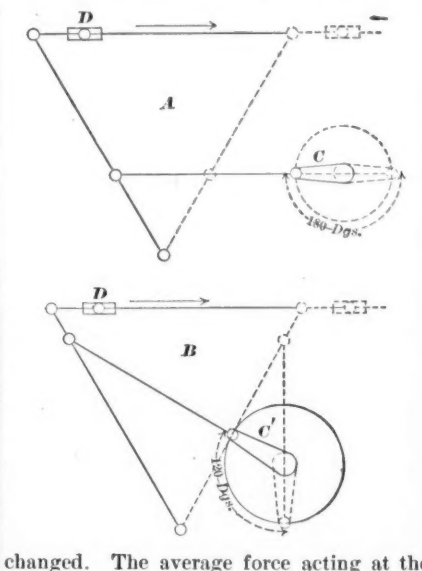
(422) W. S., Chicago, Ill., writes: Kindly inform me where I can procure the book that was mentioned in Mr. Spalding's articles on die-sinking; the title of the book is "Smithy and Forge," by W. J. E. Crane. Also name some other book on smith work and forging, one treating more on heavy forging. *A.*—"Smithy and Forge" is published by Lockwood, Crosby & Co, London. You can procure this book from any dealer in scientific works; the address of some of them is given in our advertising columns. M. T. Richardson Company, New York, also publish works on blacksmithing which may aid you.

(423) M. E. J., Philadelphia, Pa., writes: Please answer through your columns where I can obtain a few drawings of marine, horizontal and high-speed engines? I am a young machinist, and would like to study them. *A.*—We have published quite a number of them. For instance, in our issue of July 28, current volume, you will find good drawings of the battle-ship "Texas"; in our issue of June 2, drawings of the engines and boilers for the Naval Academy practice cruiser "Bancroft" are given, and by referring to other back numbers you will undoubtedly find such drawings as will suit your purpose.

(424) M. F. L., Tremont, Pa., asks: Is the strain on the cylinder head bolts of a steam engine greater when the engine is working under steam pressure than when there is no steam in the cylinder? I claim the strain on the bolts is greater. A friend claims the strain is not greater. Who is right? Please explain. *A.*—This subject has been thoroughly discussed in our issues of August 6 and 20, September 10, October 1 and 29, 1887. To be on the safe side, it is best to assume that the stress due to screwing up, which varies greatly, will bear some proportion to the steam pressure on the cylinder head, and to use good judgment in adopting a suitable factor of safety.

(425) R. S., ——, Va., writes: Please give me information as to the power required to run a 9-inch train of rolls, three high, for rolling bar-iron. *A.*—Rolling-mills are like saw-mills—the more power you put on, the more lumber you can saw. For work, say $\frac{5}{16}$x1$\frac{1}{2}$-inch, a 12x20 inch Straight line engine has done very well; it can be run fast. A 14x20-inch does better yet, running three passes at once, rolling about ten tons a day. It depends on how much one wants to do, and whether it is a jobbing mill, or where large lots of long length are to be rolled; steam pressure, too, modifies the figures. For a small mill—when a good variety in small lots are wanted—a 90-pound pressure 12x20 inch direct-connected will do; or if long stock, and small enough so the mill can double in and keep the train crowded, an engine of twice the power can be made to labor.

(426) Power, Rochester, N. Y., writes: I am not quite clear as to the following, and therefore would ask you to assist me. In sketch *A* it requires a certain power at crank *C* to operate the head *D* on the forward motion, as indicated by the arrow. How much more power will be required at crank *C* in sketch *B*? *A.*—If the distance through which the head *D* travels is the same in both cases, the same amount of work will be done in each, and therefore the power will not be



changed. The average force acting at the end of the crank *C* will vary inversely with the arc through which it acts. Thus the force at the end of the crank in sketch *A* will be as much less than the force in sketch *B* as the arc through which the former acts is greater than that of the second; or the product of the force into the arc through which it acts remains a constant quantity.

(427) G. W. B., Binghamton, N. Y., writes: In your issue of September 8 you mention taking the counterbalance from locomotive drivers in order to obtain a higher speed. I fail to see the point, but I suppose, of course, you can enlighten me. *A.*—The remark refers to engines in which the reciprocating parts are made to balance each other; for instance, as was done in the Shaw locomotive, where four cylinders were used, and arranged so that the reciprocating parts of one cylinder were made to move in a direction opposite to those of the other cylinder on the same side of the engine. By this means the reciprocating parts counterbalanced each other, and in this case a counterbalance in the wheels would not only be useless, but decidedly injurious. Of course in ordinary locomotives the counterbalance is required, and, if correctly designed, the speed will not be increased by either adding to or taking anything from the counterbalance.

(428) H. D., Ontario, Canada, writes: Some friends of mine are going to build a side-wheel steamer 75 feet long, 16 feet beam and 2 feet draught, flat bottom, to carry 200 persons. The boat is to have a speed of 10 miles per hour. They have asked me how much power it will take to drive it at that speed, and I estimated it at 50 horse-power. Since then a boat builder has stepped on the scene, and he says that 35 horse-power will be sufficient. I am only a common machinist. I have nine years of the AMERICAN MACHINIST on hand, but I cannot find the information I want. Kindly give me the data required, so that I can show it to the people interested. *A.*—A flat bottom boat is not a suitable one for the high speed such as you require, and the power will, of course, be much greater to drive it than would be required for a suitable boat. Your estimate of the horse-power is much too low—double that will not do it; in fact, we doubt if you can obtain a sufficient amount of power in such a boat to drive it at the desired speed. It seems to us that the scheme will result in a complete failure, and probably the lives of the passengers will be jeopardized. If a boat for shallow water is needed, do not attempt to build one without consulting a first-class marine architect.

(429) X. Y., Scranton, Pa., writes: Please explain the proper way of setting the cams on a locomotive to give the valves the right lead; say on a new locomotive on which there are no marks to go by. *A.*—A practical example of setting the valve gear of a locomotive is given in our issues of April 30, May 14 and May 28, 1887. 2. Please explain what is meant by lead and lap of a valve. *A.*—By lead is meant the extent of the opening of the steam valve in the line of its travel with the crank on its dead center. If, for instance, the width of opening for the admission of steam is $\frac{1}{16}$ inch when the crank is on the dead center, the valve is said to have $\frac{1}{16}$ inch lead. By lap is meant the distance by which the valve extends beyond the edge of the steam port when the valve stands in its central position. Of course the lap is measured at one end of the valve only; it is not correct to measure the lap at each end and then call the sum the "lap." Frequently the term "outside lap" is used in place of the simple term lap, to distinguish it from inside lap, which is the distance by which the valve extends beyond the exhaust edge of the port when the valve is in its central position. The inside lap is always much smaller than the outside lap, and frequently the inside lap is absent.

(430) H. G., ——, Miss., writes: Please give me the following information through your Question and Answer columns: 1. If steam is raised in a boiler to 80 pounds pressure, how high will the water be forced in a $\frac{3}{4}$ or 1-inch pipe attached to the bottom of the boiler? *A.*—Assuming that the temperature of the water in the pipe will remain at about the temperature of the atmosphere, it will rise to about 184 feet. 2. Dealers in pipe fittings sell what is called a long screw. For what purpose are they used? *A.*—These are used when it is necessary to employ jam nuts. 3. I send sketches of two arrangements of pulleys for transmitting power from an engine to a line shaft. One represents the present arrangement, in which one belt is used; the centers of the shafts are 26 feet apart, and lie in a plane of about 45 degrees to the horizon; this transmits the power satisfactorily. But it is now desired to change it to the arrangement shown in sketch 2, in which the power is transmitted from the engine to a shaft directly over it, and from thence the power is transmitted in a horizontal direction to the line shaft. The distance between the first two shafts is in this case 16 feet. Is it advisable to make the change? *A.*—When the power which is to be transmitted is well within the driving capacity of the belt, it may be run satisfactorily in a vertical direction, although on general principles we should avoid vertical belts as much as possible. If you can spare the space, we should not advise to make the change. 4. As the belt in the second arrangement will be placed vertically, will it not have to be made very tight to overcome the tendency of leaving the wheel at the bottom, or will it be best to use a tightener? If so, at what point should the tightener be used? *A.*—If the work the belt has to do is not too great for its capacity, it will not have to be made any tighter than other belts, and a tightener need not to be used. But if it is necessary to use a tightener it should be placed on the slack side of the belt, and in about the center of the length. 5. Is it considered good practice among engineers to use a small pulley to drive a larger one—say, for instance, 15, 18 or 20-inch pulley to drive a 30-inch one? *A.*—This is good practice; in fact, in many cases it cannot be avoided. 6. Considering only the question of heating a shop, is it preferable to use steam about 75 pounds pressure, or at a lower pressure? *A.*—A lower pressure is always preferable, say from 5 to 10 pounds, as such is safer and generally more economical than higher pressures.

(431) A. B. C., Columbus, Ohio, writes: I have searched my file of the AMERICAN MACHINIST to find a solution of the following problem, but I have failed to do so, and therefore ask you to kindly give me a solution of it. A railway train weighing 100 tons must be raised from a state of rest to a steady speed of 600 feet per minute within a distance of 600 feet. What is the maximum pull required at draw-bar of the locomotive, due to friction, that due to acceleration being $\frac{1}{2} m v^2$? Also what pull will be required to raise it to the given speed in 300 feet, and within 150 feet? The track is assumed to be level. *A.*—The resistance of cars to motion on a level track, when both the cars and track are in fair order, is usually taken at 6 to 8 pounds per ton of 2,000 pounds. With everything in perfect order, the resistance may fall as low as 4 pounds per ton; and when in bad working order, and the journals not well lubricated, it may exceed 10 or 12 pounds per ton. We believe that 7 pounds per ton is a fair allowance to adopt. According to this estimate, the pull on the draw-bar will be $7 \times 100 = 700$ pounds to overcome the resistance due to friction alone. In starting the train from rest, and giving it a velocity of 600 feet per minute, a certain amount of energy is stored up in it, which is called "kinetic energy" This is numerically equal in foot-pounds to $\frac{1}{2} m v^2$; in which m denotes the mass of the body, which is found by dividing the total weight in pounds by 32.2; v denotes the velocity in feet per second. Now the weight of train is 100 tons, and therefore its mass is equal to:

$$\frac{100 \times 2{,}000}{32\ 2} = 6{,}149.$$

The velocity per second is equal to $\frac{600}{60} =$ 10 feet, and consequently we have for the kinetic energy $\frac{1}{2} m v^2 = \frac{1}{2} \times 6.149 \times 10^2 =$ 307,450 foot-pounds. The pull or effort has acted through a distance of 600 feet, therefore the pull on the draw-bar due to acceleration will be $\frac{307{,}450}{600} = 512.4$ pounds, and the total pull on the draw-bar will be 512.4 + 700 = 1,212.4 pounds, or 12.124 pounds per ton. So long as the final velocity of the train remains the same, the kinetic energy of 307,450 will not be changed, and therefore if the train is started from rest to a velocity of 600 feet per minute, within a distance of 300 feet, we still have a kinetic energy of 307,450 foot-pounds, but the pull on the draw-bar will in this case be $\frac{307{,}450}{300} = 1{,}024.8$ pounds. The pull due to friction will not be changed, hence the total pull on the draw-bar will in this case be 700 + 1,024.8 = 1,724.8 pounds, or 17.248 pounds per ton. The whole process can be given in a single formula, which will give exactly the same result. It is as follows:

$$P x = R x + \tfrac{1}{2} m v^2.$$

In which P denotes the pull in pounds, R the resistance in pounds, and x the distance through which the pull P or the resistance R acts; m and v denote the same quantities as before. Applying this formula to the last conditions given in the example, we have:

$$P \times 150 = 700 \times 150 + 307{,}450.$$

Consequently the pull on the draw-bar will be:

$$\frac{700 \times 150 + 307{,}450}{150} = 2{,}749.6 \text{ pounds,}$$

or 27.496 pounds per ton.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

There is a short lecture on agents on page 20.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Ideal Drawing Stands. M. C. Hammett, Troy, N.Y.

Forming Lathes, Mer. Mach. Tool Co., Meriden, Ct.

A. D. Pentz, Consulting. Tools. Elizabeth, N. J.

Tool Holder: Armstrong Bros. Tool Co., Chicago.

New lists of cutters. Brown & Sharpe.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Drop Presses, Punches and Shears. Williams, White & Co., Moline, Ill., manufacturers.

Pattern and Brand Letters. A variety of sizes and styles Heber Wells, 8 Spruce St., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N.Y.

S. A. Smith, 23 S. Canal St., Chicago, Ill., is agent for Standard Tool Co.'s Twist Drills.

Pulley lathes, most efficient offered. The Lodge & Shipley Machine Tool Co., Cincinnati, O.

J. S. Thurman, M. E., Indianapolis, Ind., Expert Patent Solicitor. Inventions Perfected.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc

For the Latest Improved Diamond Prospecting Drill, address the M. C Bullock Mfg Co., cor. Canal and Washington Sts., Chicago, Ill.

Patterson, Gottfried & Hunter, Limited, 146-150 Centre st., New York, are putting on the market a new alarm speed indicator. Send for circulars.

S. W. Card & Co., Mansfield, Mass., are putting on the market a new line of stocks and dies, with their patent adjustable dies and guide S. A. Smith, 23 S. Canal Street, Chicago, Ill., Western Agent.

25" }
32" } "Only Drill Press built on 'Ko-rekt' principles,
37" } Even if they come from Jersey."
42" } Gould & Eberhardt, Newark, N. J.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases,
31 Nassau Street, New York.
Send for Brief History of Patent Legislation

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUBLISHING CO., 203 Broadway, New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

The Mile in Different Countries.

There is no wonder there is some uncertainty about the length of a mile. English-speaking countries have four different miles—the ordinary mile of 5,280 feet, and the geographical or nautical mile of 6,085, making a difference of about one-seventh between the two; then there is the Scotch mile of 5,928 feet, and the Irish mile of 6,720 feet; four various miles, every one of which is still in use. Then almost every country has its own standard mile.

The Romans had their *millpassuum*, 1,000

paces, which must have been about 3,000 feet in length, unless we ascribe to Cæsar's legionaries great stepping capacity.

The German mile of to-day is 24,318 feet in length, more than four and a half times as long as our mile.

The Dutch, the Danes and the Prussians enjoy a mile that is 18,440 feet long, three and a half times the length of ours, and the Swiss get more exercise in walking one of their miles than we get in walking five miles, for their mile is 9,153 yards long, while ours is only 1,760 yards.

The Italian mile is only a few feet longer than ours, the Roman mile is shorter, while the Tuscan and Turkish miles are 150 yards longer. The Swedish mile is 7,341 yards long, and the Vienna post mile is 8,296 yards in length.

So here is a list of twelve different miles, and besides this there are other measures of distance, not counting the French kilometer, which is rather less than two-thirds of a mile.

The Brazilians have a mile that is one and one-fourth times as long as our mile; the Neapolitan migho is about the same length; the Japanese ri, or mile, is two and one half times ours; the Russian verst is five eighths as long as our mile, while the Persian standard is a fersakh, four and a half miles long, which is said to be equal to the parasang, so familiar to the readers of Xenophon's "Anabasis."

The league that is familiar to readers of French and Spanish books varies just as does the mile. In Brazil it is three and four-fifths miles long. In France it was three miles, in Spain it was two and two thirds miles, and once on a time in England it was two and one-half miles long. The only measure that is about the same in every country is the meter, and even that varies slightly, for in France it is 39.370432 inches in length, while in this country it is 39.37079 inches—a difference to be mentioned, but not to be considered in practice.—*San Francisco Examiner.*

The Typewriter's Trials.

"Are you Miss Plumkins, the new stenographer?" asked Mr. Cumrox.

"Yes, sir."

"Well, put this in a letter: Smith & Co., Wauscoghenoc, Me. Sirs: That last consignment of yours was all out of gear. There wasn't nothing in it that we could use. It was the all-firedest lot of stuff I ever set eyes on," he continued, growing excited. "Why, I tell you, Miss Plumkins, some of it was positively gosh awful.

"It was moth eaten, and we had to disappoint old-timers in our trade just because these jays didn't come up to the scratch and do business. What I want to know is what they are goin' to do about it," and he paused for breath. He thought a moment and said, "Got all that?"

"Y-yes," replied the young woman, rather doubtfully.

"Well, fix it up and put 'Yours respectfully' after it, and let me see it."

And yet people seem surprised when stenographers lose their minds.—*Washington Post.*

Our Sea Post-offices.

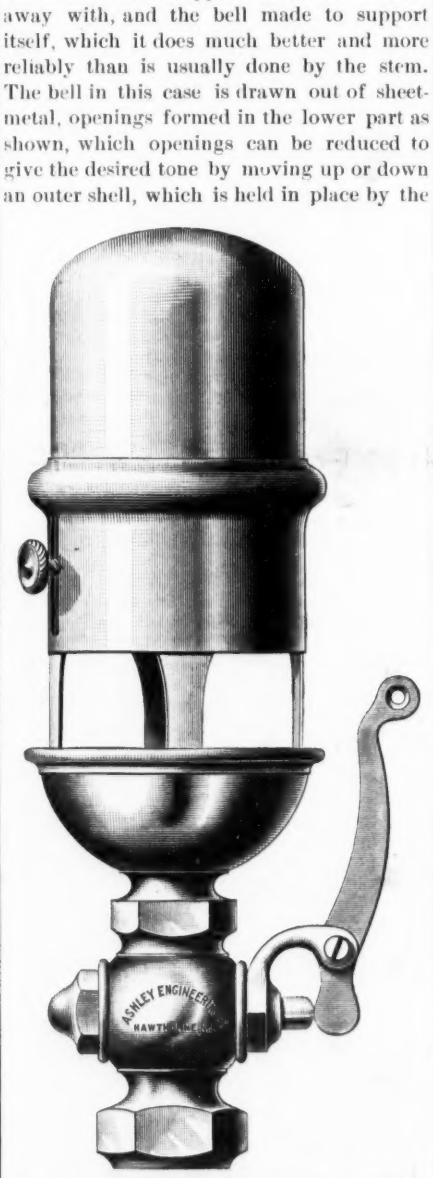
Another marked success of the present postal administration is the sea post-office system recently inaugurated. It is the application of the railway mail principle to ocean steamers, and is now in operation on the two principal lines of German steamers. Letters and parcels are so thoroughly distributed on shipboard that those addressed for delivery in the terminal cities are on arrival ready for immediate delivery by carrier, and the mails for inland offices prepared for immediate dispatch by the first railway mail train after arrival. The gain in the time of local delivery at New York is from two to fourteen hours, while the service to interior offices is quickened from four hours on direct lines near the seaboard to seven days on star routes and remote western lines.

This important service was started March 31, 1891. During the first quarter thirty-nine trips were made from Germany to New York; during the last quarter, for which complete returns have been received—that ending March 31 1892—there were sixteen fewer trips westward, owing to the customary withdrawal during the winter, and yet there was a gross increase of over 27 per cent. in the number of distributions, and an increase in the average number distributed per trip of over 100 per cent, and a large increase was noted on the east-bound trips.

The accuracy with which this work is done appears in a record of only 363 errors of all kinds in the distribution on the westward trips, or 1 in every 4,000 pieces handled. The statistics of the service, so far as received since March 31, 1892, indicate a steady growth in the volume and efficiency of this new system. Letters for delivery as far west as Cincinnati, Chicago and St. Louis may be acknowledged by return steamer if the addressees are prompt in giving them attention.—*Mail and Express.*

Drawn Bell Steam Whistle.

We present herewith an illustration of a new steam whistle, in which the usual central stem which supports the bell is done away with, and the bell made to support itself, which it does much better and more reliably than is usually done by the stem. The bell in this case is drawn out of sheet-metal, openings formed in the lower part as shown, which openings can be reduced to give the desired tone by moving up or down an outer shell, which is held in place by the



small screw shown, which passes through a slot in the outer shell, and is tapped into a part of the bell which is thickened for that purpose by soldering a piece to the inside of it. For high-pressure steam, such as is usually used in locomotives, this outer shell is not required. The valve shown is separate from the whistle, the two being joined by a thread, which gives the advantage that the whistle can be used in connection with any kind of a valve desired, or may be screwed directly onto the end of a pipe. These whistles are made in various sizes up to 6" by the Ashley Engineering Co., 136 Liberty street, New York City.

Chinese railway building is expensive work, even at 10 cents per day paid for common labor. Consul Gardiner describes the building of a 17-mile line now being constructed to bring coal and iron from the Wang-Shan-Shih mines. Work has been going on eight months, and the road will be finished in three or four months more. The work is costing more than it would in England, owing to the poor physique of the laborers. A barrow that a European could easily trundle full is only half-filled, and it takes two Chinamen to push it at a very slow speed, with many stops for rest. To humor the people, land is bought at 300 dollars per acre, or more than twice its value. Cut limestone for bridges and culverts is very expensive, and the expense of breaking stone for ballast is so great that iron ore is being used. The rails and metal ties all come from Germany, and the engineer is Mr. Schweidtweiller, an ex-attaché of the German Legation at Pekin.—*The Engineer.*

Bad for the Gas Trust.

A Chicago dispatch says: A demand has finally been made for the appointment of a receiver for the Chicago Gas Trust. In the Circuit Court to-day Thomas H. Martin filed a bill against the Chicago Gas Light and Coke Company, the People's Gas Light and Coke Company, the Consumers' Gas Company, the Equitable Gas Light and Fuel Company, the Hyde Park Gas Company, the Lake Gas Company, the Chicago Gas Company, and the Fidelty Insurance Trust and Safe Deposit Company of Philadelphia.

The court is asked to appoint a receiver for these companies, whose duty it shall be to take possession of all the assets, franchises and privileges belonging to the various concerns, and continue to manufacture gas under the direction of the court; also to enjoin the Fidelity Insurance Trust and Safe Deposit Company from acting as trustee under contracts executed on May 15, 1887, and on March 22, 1890, under which the companies were consolidated. The court is further asked to cancel the stocks held under these contracts, and to place them in the hands of a receiver. Meanwhile an injunction is sought to restrain any disposition of the stock.

It is related in a book recently published in England that the railway manager in England who first introduced third-class carriages in England was sent for by the Duke of Wellington, who vigorously protested against an innovation which, he said, "would soon cause the working classes to go wandering idly about the country, instead of staying at home at work, minding their own business."

It is said, with a good deal of truth, that the man who is always punctual spends much time waiting for others.

MANUFACTURES.

Burnet, Tex., is to have a flour-mill.

Longview, Tex., is to have a planing-mill.

Palestine, Tex., is putting in a canning factory.

Jacksonville, Tex., is to have a canning factory.

Galveston, Tex., is to have a woodenware factory.

Stafford, Tex., is to have a box and basket factory.

Jefferson, Tex., is to have a cotton-seed oil refinery.

A boot and shoe factory will be built at El Paso, Texas.

Houston, Tex., is to have a spring bed manufactory.

The Demorest (Ga.) Machine Works will enlarge its plant and add a foundry.

A steel plant is to be built at Reading, Pa., to manufacture a special brand of cutlery steel.

J. B. Boyle and others are establishing a $15,000 iron foundry and machine shop in Westminster, Md.

The Bogart Engine Company, at Covington, Ky., will enlarge its plant, and erect a factory 40x200 feet.

The Riverside Steel Pipe Works will add a galvanized iron plant to their works at Benwood, W. Va.

The Economy Feed-water Heater Company, of Guilford, N. H., has been incorporated, with $50,000 capital.

The C. H. Hutchinson Foundry Machine Company, of Manchester, N. H., has been incorporated, with $60,000 capital.

The National Malleable Castings Company, Chicago, Ill., will erect ten one story shops and boiler house, costing altogether $120,000.

The Rough and Ready Engine Company, of Greenwich, N. Y., are contemplating purchasing a new engine.

Chilicothe Mill and Elevator Company has been chartered at Austin, Tex., with a capital stock of $30,000; directors, A. J. Thompson and others.

The Burgess Sulphite Fiber Company has been organized at Portland, Me., with a capital stock of $200,000. W. W. Brown, of Portland, is president.

The work of laying the foundation of the new woolen-mill at Guilford, Me., was commenced recently. D. Huff, of Dexter, has charge of the stone work.

Work has been begun on a new boiler house for the Slater Manufacturing Company, Webster, Mass. The structure is to be of stone, 60x40 feet. Six boilers will be put in.

The Lackawanna Lubricating Company, Scranton, Pa., has issued a descriptive and illustrated circular of grease cups. It is an interesting catalogue for the engineer and mechanic.

Samuel Price, foreman at Baylor's cigar factory, is having erected on his lot on East South street, York Pa., a warehouse and factory for the manufacture of cigars. He will employ a number of workmen.

A brick addition is being made to the soft rubber works at Bloomingdale, N. J., the company preparing to put in a steam engine, as the Pequannock River can no longer be relied upon to furnish motive power.

The Erie Railroad intends to use the trolley system of motive power in some department of the road, presumably for switching cars, and has petitioned the New York State Railroad Commission for permission to use it.

A plant for the manufacture of tinware will be established at Bowling Green, O., soon, by an incorporated company. H. H. Clough and J. S. Giles are the principal men in the concern. About one hundred men will be employed.

The Harriman (Tenn.) Tack Company will add machinery for tin and brass capping trunk nails and tacks, and machinery for making double-pointed tacks and staples and for making wire brads; V. G. Farnham, manager.

Watson & Stillman have found it necessary to run their hydraulic machinery works, at 204, 206, 208 and 210 East Forty-third street, both night and day, to keep apace with their orders. The prospect for future business is very promising.

The American Ice Company, of Bangor, Me., are rapidly rebuilding their plant, destroyed by fire June 1st. The frame of the main buildings is up, and some of the boarding has been done. The new plant will have many improvements over the former one, will have a large capacity, and all modern appliances and conveniences.

A new railroad across the continent in a direct line between New York and San Francisco, to cost $900,000,000, is projected. English capital to build the line, it is claimed, is behind the scheme. By following a straight line, tunneling hills and bridging rivers and ravines, 800 miles in distance will be saved. The line through New Jersey is now being surveyed.

A report from Galveston, Tex., states: The question of right of way having been settled, a large force of men began the grading of the North Galveston Railway at Virginia Point Sept. 14. The work will be pushed with all possible dispatch, and it is expected to have the road completed and fully equipped for business to North Galveston by the first of December.

The certificate of incorporation of Nightengale Brothers & Company was filed with the N. J. County Clerk yesterday. The company is organized for the purpose of manufacturing all kinds of silk goods in Paterson, N. J. The incorporators are Joseph Nightengale, John Nightengale, Ismerie Nightengale and Elizabeth Nightengale. The capital stock is $6,000, all paid in.

The Casco Paper Box Company has been organized at Portland, Me., to manufacture and deal in paper boxes of all kinds. The new company will commence business immediately at Nos. 117 to 119 Middle street. The directors are John B. Curtis, A. S. Hinds, Horace H. Shaw, Lewis A. Goudy and Edwin L. Goding. Mr. Hinds is president, and Mr. Goding is treasurer.

The Berlin Iron Bridge Co., of East Berlin, Conn., are building a new machine shop for the Mather Electric Co., at South Manchester, Conn. The building will be 52 feet wide by 150 feet long, the central portion being 35 feet in width, and controlled by a 15-ton traveling crane. The design is a combination of iron and wood, all the heavier parts of the building being of iron.

The Stearns Manufacturing Co., Erie, Pa., has control of the Woodbury automatic steam engine, and these engines will hereafter be built by this company. The Stearns Company are amongst the largest builders of engines in the country, and will undoubtedly make a success of the "Woodbury." John F. Haskins, 244 Drexel Building, Philadelphia, is general sales agent for the Stearns Company.

The Nicholson File Company, Providence, R. I., issue a catalogue and a large engraved card in illustration of the production of the works. In the catalogue the company says: First. The rows of teeth are spaced progressively wider, from the point toward the middle of the file, by regular increments of spacing; and progressively narrower, from the middle toward the heel, by regular decrements of spacing. Second. This general law of the spacing of the teeth is modified, by introducing, as they are cut, an element of controllable irregularity as to their spacing, which regularity is confined within maximum and minimum limits, but is not a regular progressive increment or decrement. Third. In arranging the teeth of files, so that the successive rows shall not be exactly parallel, but cut slightly angularly with respect to each other—the angle of inclination being reversed (during the operation of cutting) as necessity requires. Files possessing the characteristics above mentioned do not produce channels or furrows in the work, but effect a shearing cut—for the reason that no two successive teeth in any longitudinal row of a cross-cut file are in alignment; the file is thereby able to cut more smoothly and more rapidly, and possesses greater endurance as a tool for dressing metal than any file whose teeth are not disposed upon the same principle.

A recent dispatch from Elizabeth, N. J., says: A portion of the large works of the Singer Manufacturing Company, at Elizabethport, were destroyed by fire this morning. The fire began about 2 o'clock in the cabinet shop, spread rapidly to the pattern and carpenter departments and engine house, completely ruining them. Three locomotives and a number of freight and coal cars were also burned. The total loss will be over $65,000. Several hundred employes are thrown out of work. The entire fire department of Elizabeth was called into service. The steam lighter "Advance" and several tugs fought the fire from the company's wharves. The flames, swept by the strong wind from the northwest, leaped across the freight yard and caught the buildings alongside the Central Railroad tracks, but the fire was checked before it made much headway. The carpenter and cabinet shops furnished employment to about 600 men. They will be rebuilt at once, say the officials of the company. The fire is supposed to have originated from spontaneous combustion in the rubbish collected in the engine room. It was 6 o'clock before the fire was under control. The fire will seriously cripple the operations of the whole plant, which employs nearly 4,000 persons. The large storehouse, containing the parts of nearly a hundred thousand machines, was saved with great difficulty. Had it not been for the tugs playing from the water front the building would have been doomed. This is the second great fire at the Singer works within two years. The former fire cost the company $975,000.

Machinists' Supplies and Iron.

New York, October 1, 1892.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $15 to $15.50; No. 2, $14 to $14.50; Gray Forge, $13 to $14. Southern brands of good quality are obtainable at $15 to $15.50 for No. 1 Foundry; $13.50 to $14 for No. 2; and $12.25 to $13 for Gray Forge.

Scotch Pig—Coltness is quoted at $21; and $20.25 for Eglington.

Antimony—The market is flat. We quote L. X., 10c. to 10¼c.; Cookson's, 11c. to 11¼c.; Hallett's, 10c. to 10¼c.

Copper—The market has a steady tendency. Bids at 11c. for Lake Copper have not been accepted; holders are asking 11.08c. to 11.15c. for round lots, and car loads are quoted at 11.10c. Casting Copper is held at 10¼c. to 10¾c.

Lead The market is more active. There are offerings at 4.07½c., with 4.05c. bid for round lots. Inquiries are increasing, and more than usual interest is manifested in a quiet way by large consumers.

Lard Oil—Prime City is quoted at 63c. to 64c.; Western on spot at 62c.

Spelter—The market is unsteady. Car loads for New York delivery have been released at 4.05c., and this price, if not less, will still buy.

Tin—The market is easier, and there is a lack of speculative interest. Transactions at 20.15c. to 20.35c. for October delivery have been made.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. Seven words make a line, and the address as desired to appear should be included. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Mecbanical draftsman, age 24, desires position at once. Address Box 5, American Machinist.

Wanted—Situation by experienced draftsman designer. Address Box 4, American Machinist.

Young man, exp'd, wants sit. as draftsman, ass't sup't or foreman machinist. Box 6, Am. Mach.

Wanted—Sit. by a comp. mech. draftsman; A1 refs. C. D., 272 Worthington St., Springfield, Mass.

Position as superintendent, by one who at present is employed as foreman in one of the first-class shops in the country. Address Box 99, Am. Mach.

Wanted—Ass't pattern foreman for architectural iron work. A fine opening for an ambitious young man. The Snead & Co. Iron Works, Louisville, Ky.

Position as foreman, by one holding such a position at present; but desires to make a change. Address Box 100, American Machinist.

Wanted—Three planer hands, 3 lathe hands, and 2 floor hands, all first-class men. Sioux City Engine Works, Sioux City, Iowa.

Mechanical draftsman, aged 24, with exp. in drawing office and engine shop, desires position. "Swede," Riverside Iron Works, Detroit, Mich.

Wanted—Position as supt. or gen'l foreman, in shop building Corliss engines and general work. Address F., American Machinist.

Wanted—Metal pattern maker on patterns for iron pipe fittings and valves. Apply to the Kelly & Jones Co., Greensburg, Pa.

Wanted—Two good heavy tool hands, and one or two good floor hands, on Corliss engine work. Brass Foundry and Machine Works, Ft. Wayne, Ind.

Wanted—Foreman for a small shop in a city in Conn. build'g mach. tools; must have energy, practical knowledge, and a manager of men. Address, stating age, experience, etc., W. L., Am. Machinist.

Wanted—Mech. draftsman, with exp. in mine and pumping machinery. Address, with full particulars as to exp., age, etc., to Jeanesville Iron Works, Jeanesville, Luzerne Co., Pa.

Wanted—To take charge of refrigerating ice plant in small city or town, or employment as machinist, the object being to have a permanent home; best references. Box 2, Am. Machinist.

Mechanical draftsman, graduate from a German college, aged 22 years, with good knowledge in general machinery from U. S. and Germany, wants position. Address Box I. S., Tonawanda, N. Y.

An exp'd draftsman on automatic compound engine work, a machinist, and a M. E. graduate, desires a position at once as draftsman or as technical instructor. Box 28 C, American Machinist.

Wanted—A first-class machinist on fine work; must be good tool maker and brass pattern maker; works 12 miles from New York. Address giving age, experience, reference, and wages expected, Box No. 1, care American Machinist.

Wanted—Position as foreman in pattern shop, by young married man; 15 years' experience in machine and architectural patterns; have run large job shop; can design, lay out, and make estimates; expert on gears; know how to handle men; highest references. X. Y. Z., care American Machinist.

The mechanical engineer of one of the large steel works in the country is open for an engagement in October; prefers to locate in the vicinity of New York City as mechanical manager for some small concern that is growing up or to connect himself with an Electric Motor Company; 40 years of age, and 20 years' exp. Box 3, American Machinist.

Wanted—In the neighborhood of N. Y., an energetic, accurate draftsman, who is capable of taking charge of a drafting room; one accustomed to steam plant work preferred; also a young man who can take dictation and operate on a Hammond typewriter, and about half of his time will be occupied in the drafting room. Address, stating age, remuneration expected, and experience, Engineering, care of the American Machinist.

HACKNEY HAMMERS

Meet all requirements more fully and satisfactorily than any other of its competitors.

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INVESTIGATION IS CONVINCING.

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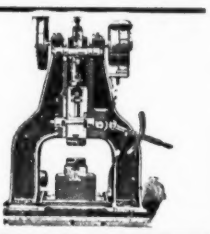
THE HACKNEY HAMMER CO.
20 Johnson St., CLEVELAND, O.



CLOUGH'S Combination Gear Cutters.

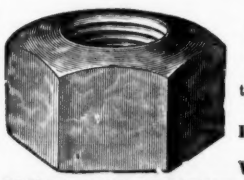
One pair cuts a pitch from 12 teeth to a rack. These Cutters are made double or a solid single cutter; also to mill tops of teeth at one operation, thereby saving turning blanks. Kept in stock. Shipped promptly. Special work to order. Circular and prices of

R. M. CLOUCH,
TOLLAND, CONN.

MACHINISTS, Write for Circular of

COMBINATION INSIDE MICROMETER CALIPER AND DEPTH GAUGE.
Agents wanted. J. T. SLOCOMB & CO., PROV., R. I.

FINISHED HEXAGON NUTS



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Wilmington, Delaware, U. S. A.
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21 Cross St., Finsbury, London, England.

SOFT GRAY IRON CASTINGS.

From ½ oz. to 1000 lbs. Small Castings a Specialty. Light machinery wanted to build.

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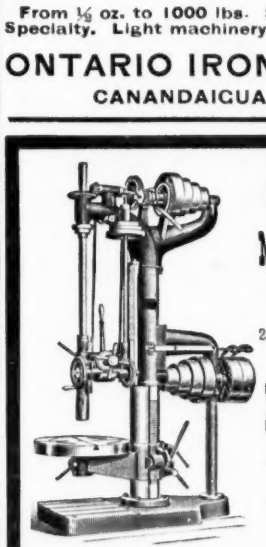
A MODERN TOOL.

14 in. x 6 ft. ENGINE LATHE.

22 in. x 8 ft., 10 ft., 12 ft., 14 ft. x 16ft. LATEST IMPROVED ENGINE LATHES.

Address DIETZ, GANG & CO.,
58 and 60 Penn St., Cincinnati, O., U. S. A.



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MODERN 26" and 32" Back Geared and Power Feed Drill Presses A SPECIALTY.

Prices Reasonable!

READ WHAT THEY SAY!

Buffalo, N. Y., Sept. 9th, 1892.
Gentlemen:—We are pleased to say that so far the 26 in. drill press purchased from you has given us *entire satisfaction*. The machine is *as you represented* it, and we have every reason to believe that it will continue to do good service. Yours truly,
THE BUFFALO SCALE CO.

Thurlow, Pa., Sept. 12th, 1892.
Gentlemen:—Referring to the 26 in. drill press which you furnished us some time since, we have had it in *daily use*, it gives us *entire satisfaction*, and we consider it a very *efficient tool*. Yours truly,
THE STANDARD STEEL CASTINGS CO.

Correspondence Solicited.

HAMILTON MACHINE TOOL CO.,
N. E. Cor. Water & Market Sts., Hamilton, Ohio, U. S. A.

Bradley Hammers.

If you plate, draw, square, taper, swage, collar, spindle, or do any manner of die forging in iron or steel, a BRADLEY HAMMER will soon pay for itself, by what it will save over any other similar tool. Send for circulars.

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NEW CONSTRUCTION,
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UNIVERSAL TRIMMERS for PATTERN MAKING.

ALL SIZES AND STYLES, NEW AND SECOND-HAND.
Each Machine inspected, and guaranteed to be in perfect working order, before shipment.
RANGING IN PRICE FROM $10.00 UPWARDS.
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SPECIAL MACHINERY.

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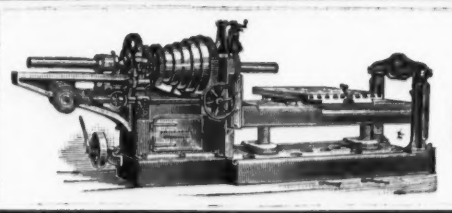

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MACHINE TOOL BUILDERS.
IMPROVED PATTERNS! LATE DESIGNS!

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ASBESTOS CEMENT FELTING,

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Samples and Descriptive Price List Free by Mail.

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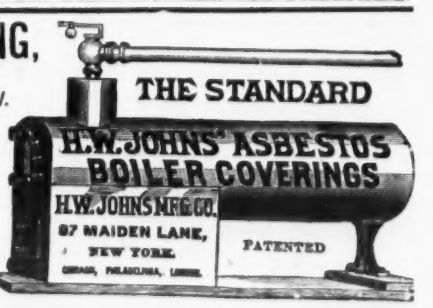

Wanted—A man capable of sup'tding a moderate sized agricultural mach'y plant; must possess exec. ability, intelligence, with a thor. knowledge of gen. mach'y; without these qualifications don't apply; unquest'd ref's required; state past exp. Improvement, S 28, care Lord & Thomas, Chicago, Ill.

✠ MISCELLANEOUS WANTS ✠

Advertisements will be inserted under this head at 35 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d-hd lathes & planers. S. M. York, Clev'd, O.

Best Steel Flue Scrapers. Kelley Co., Erie, Pa.

Presses, Wire Form'g Mchy. Am. Tool Wks, Clev, O.

Bolt Cutter Heads a Spec'y. Am. Tool Wks., Clev., O.

Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

Engines, special and gen. mach'y designed; ideas developed. A. W. Jacobi, 136 Liberty St., N. Y.

Special machinery designed and built. C. F. Langston & Co., 70 N. 4th St., Philadelphia.

Screw-cutting lathe, 26″ by 84″, with costly chucks and tools, $190, on sale. Box 229, AM. MACH.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Design & superintendence of mach'y. Drawings, etc., made. Claud Mantle, 598 E. 134th St., N. Y.

For Sale—Second-hand drill presses, engine lathes and planers. Dietz, Gang & Co., Cincinnati, O.

Plans of mills and machinery furnished by practical draftsman. Box 98, AM. MACHINIST.

Wanted—Hardware specialties to build. Send 25 cents for "Eureka Knife and Shears Sharpener." W. A. Smith & Co., 227 Eddy Street, Providence, R. I.

Bound volumes for 1891. We are now prepared to take orders. Price, $4.00 per volume; express charges payable by purchaser. Address AMERICAN MACHINIST, 203 Broadway, New York.

We will pay 25 cents each for copies of the AMERICAN MACHINIST of December 25, 1886, issue; must be unsoiled and in good condition. AMERICAN MACHINIST PUBLISHING COMPANY, 203 Broadway, New York.

Special, experimental or other light machinery manufactured. Best equipped shop in the West for fine work. Manufacture one of the best hollow spindle bench lathes for the tool room or for manufacturing. Write us. Moseley & Co., Elgin, Ill.

For Sale—Stock in large iron manufacturing business, together with official position at fair salary, in a town of 40,000 inhabitants; good reasons for selling. Will take cash or good property. Address BOX 84, AMERICAN MACHINIST.

$75.00 FOR ONE NEWSPAPER ARTICLE.—*The Tradesman*, of Chattanooga, Tenn., offers $75 in gold for the best single article on what line of industry would pay best in the South. For particulars address *The Tradesman*, Chattanooga, Tenn.

Wanted—One engine lathe—new or second-hand in good order—100″ or 120″ swing, to take 15′ between centers; give full description of machine, with weight and photograph. Address B. W. P., P. O. Box 2227, New York City.

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All sizes of FLATHER.
" " BLAISDELL.
" " FIFIELD.
One each, 14″x6′ and 24′x12′ FITCHBURG.
One 78″x15′ SELLERS.

PLANERS.

All sizes of WHITCOMB.
" " FLATHER.
One each, 30″x8′ and 36″x8′ PEASE.

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All sizes of PRENTICE.
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All sizes of HENDEY and GOULD SHAPERS.

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10 ft.x10 ft.x16 ft. Planer. 1 Head.
72 in.x48x30 ft. 3 Heads.
72 in.x48 ft.x21 ft. do 3 Heads, Detrick & Harvey, new.
52 in.x48 in.x17 ft. do 1 do
54 in.x42 in x24½ ft. do 2 do
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42 in.x42 in.x16 ft. do 1 do
39 in.x36 in.x12 ft. do 1 do
36 in.x38 in.x8 ft. do Powell A1.
30 in.x30 in.x7 & 8 ft. do 1 Head.
26 in.x26 in.x6 ft. do 1 do
25 in.x24 in.x6 ft. do 1 do
22 in.x21 in.x5 ft. do 1 do
50 in.x30 ft. Bed Triple Geared. New Engine Lathe.
36 in.x24½ ft. New Haven do do
30 in x28 ft. D. W. Pond Shafting Lathe.
32 in.x12, 14, 16, 18 ft. Bed. New Engine do
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18 in.x 6, 7 & 8 ft. do New & do do do
17 in.x 8 ft. do do do do
16 in.x 6 & 8 ft. do do do do do
15 in.x 6 & 8 ft. do do do do do
14 in.x 6 ft. do do do do do
Car Axle Lathe, Bement.
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15, 16, 18, 25 in. Crank Shapers.
20, 24, 26 & 30 in. Geared Shapers.
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2 Garvin No. 4 Millers, A1.
1 Brainerd No. 3 Miller, A1.
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42 in. Sellers Hyd. Wheel Press.
2,000 lb. Bement Steam Hammer.

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26 in. x 8 ft. Blaisdell, raised to 36 in., Compound Rest, rod feed. In good order.
15 in. x 8 ft. Fitchburg, Rise and Fall Rest, 10 in. Universal Chuck. A1 condition.
15 in. x 6 ft. Blaisdell, Rise and Fall Rest, 5 in. three Jaw Universal Chuck, Lathe Tools. Good order.
20 in. x 6 ft. Bullard Turning Lathe, Plain Rest, Taper Attachment. A1 condition.
12 in. x 4 ft. Reed, Back Geared Turning Lathe, Rise and Fall Rest. A1 condition.

PLANERS.

42 in. x 36 in. x 12 ft. Gleason, one Head on Rail. Good as new.
30 in. x 30 in. x 8 ft. Hewes & Phillips, one Head on Rail. A fine tool. Good as new.
24 in. x 24 in. x 5 ft. Whitcomb. Good order.
18 in. x 22 in. Lathe & Morse Crank Planer and Vise. A1 condition.

MISCELLANEOUS.

24 in. Sliding Head, Wheel and Lever Feed. Quick Return Drill Press. Good as new.
6-Spindle Garvin Drill Press. Good as new.
4-Spindle Pratt & Whitney Drill Press. A1 condition.
16 in. Hendey Geared Friction Shaper. Good order.
2 Brown & Sharpe Screw Machines. A1 condition.
Brown & Sharpe Surface Grinder. A1 condition.
Pratt & Whitney 2-Spindle Centering Machine. Good as new.
Lodge & Davis, 15 in. x 5 ft. Turret Lathe, 3 Extra Chucks, 3 box tools. Good as new.
2-Spindle Ames Profiler. Good order.
One Merritt Back Geared, Heavy Miller, Overhanging Arm, 36 in. x 12 in. Table, 4 "T" Slots. Good order.
15 in. x 7 ft. Square Arbor Fox Lathe, Chasing Bar, Set Over Tail Stock, Compound Slide Rest. Good order.

Nearly 500 other new and second-hand tools in stock. Write for full list and prices.

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New and Second-hand (In Stock.)

Milling Machine, Universal. Improved style.
" " Back Geared and Arm. " "
" " Plain with feed (small.) " "
" " Lincoln pattern. Good order.
" " Brainerd No. 8. A1 order.
Screw Machine, No. 3 with 15-16 hole, Bk. Geared, Auto. feed.
" " complete with Ck. and Tools, Jones & Lamson.
" " No. 5, with 1 3-8 hole, Chasing-bar. Good order. Brown & Sharpe.
" " No. 5, with 1 3-8 hole, Chasing-bar and Auto. Chuck. Good order. Brown & Sharpe.
" " No. 11, with 2 1-8 hole, Clutch Gears, Turret Feed, Chasing-bar, and complete with Chucks and Tools. A1 order. Jones & Lamson.
Profiling Machines, 2 Spindles. Good order. Pratt & Whitney.
Die Sinking Machine. A1 order. Pratt & Whitney.
Gang Drills, 3 Spindle. Good. Garvin.
" Sensitive, 3 Spindle. Slate.
" 4 Spindle. A1. Pratt & Whitney.
Upright Drill, 24 in., complete. Good. Ames.
Radial Drill, 60 in., complete. Extra heavy, Improved style.
Shaper, 9 in. stroke. Good order. Gould.
" 11 in. stroke Trav. head, extra heavy, with 2 tables.
" 14 in. stroke, latest pattern. A1. Fitchburg.
" 15 in. stroke, crank motion, Improved style.
" 24 in. stroke, triple geared. "
Gear Cutter, 36 in. Good order. Low price. Gould's.
Centering Machine, 4 in. Good order. Whiton's.
Slotter, 8 in. stroke. Modern style. Good order.
Upright Boring and Turning Mill, 38 in. swing. A1 order
Bolt Cutter, 1½ in. Good order. Sellers.
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Riveter, 60 in. with hoisting rig. Good order.
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Engine Lathes, all sizes, 13 to 60 in. swing.
Planers, all sizes, 16 to 48 in. swing.
Drills, all sizes, 20 to 36 in. swing.

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SUCCESSOR TO E. P. BULLARD'S N.Y. Mach'y Warerooms.
68 Cortlandt Street, NEW YORK.

SENSITIVE KNEE DRILL

Both hands to handle work. Double capacity over old plan.
SEND FOR CIRCULAR.

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83 Washington St., Brooklyn, N. Y.

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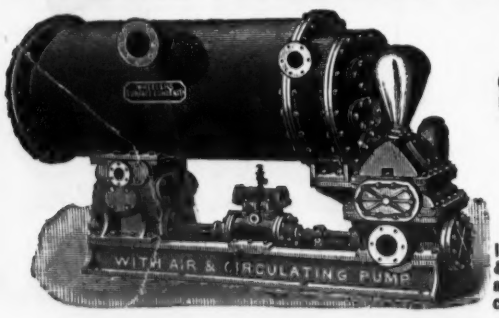

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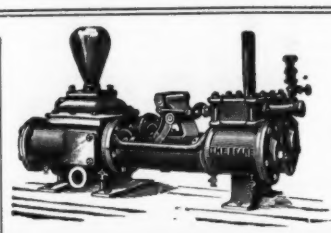

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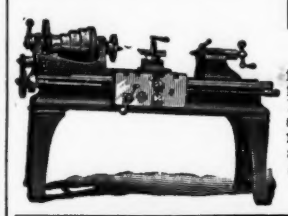

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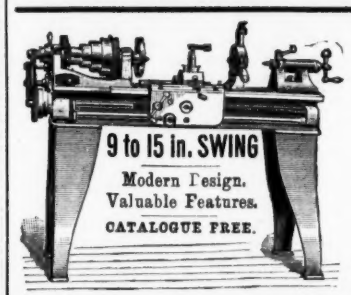

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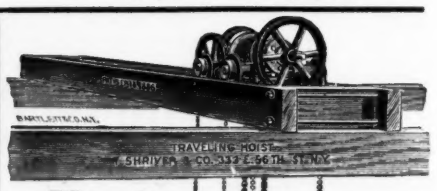

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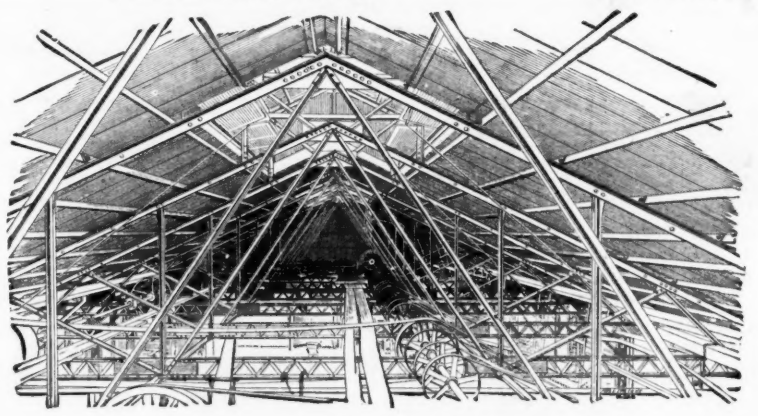

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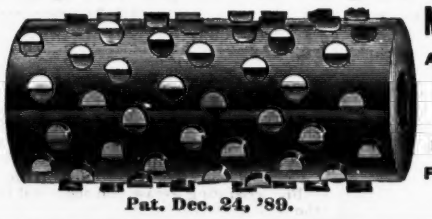

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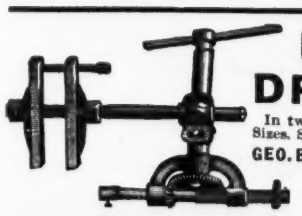

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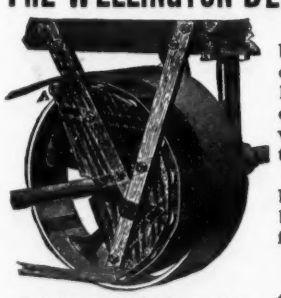

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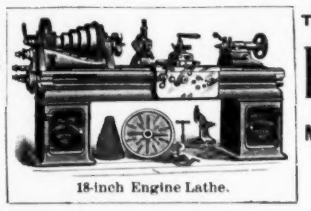

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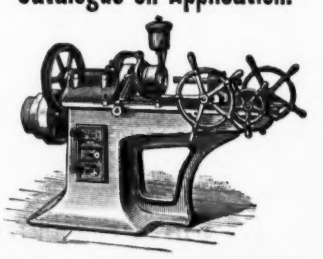

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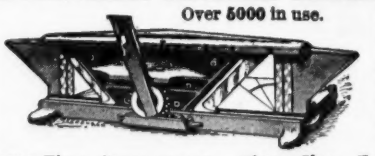

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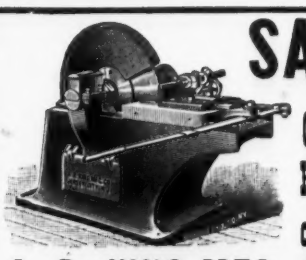

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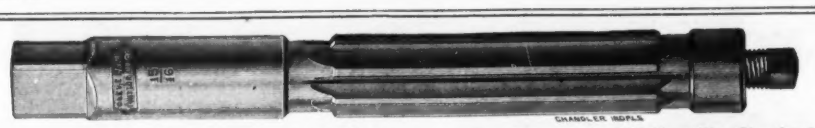

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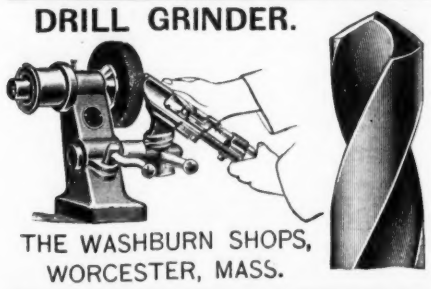

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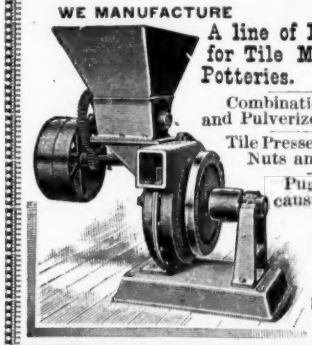

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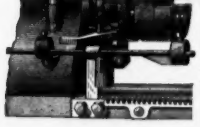

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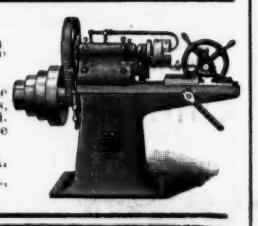

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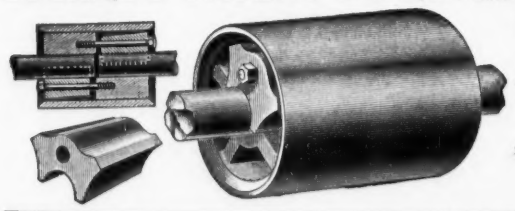

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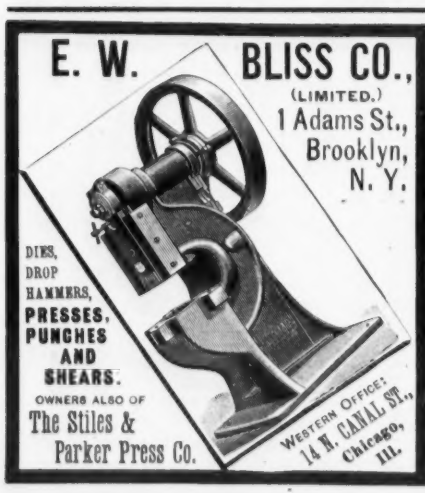

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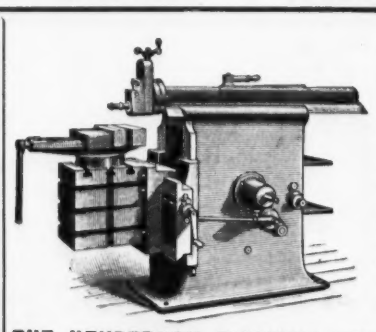

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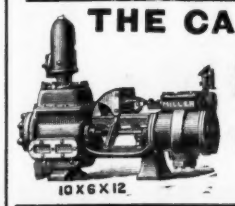

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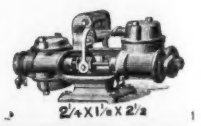

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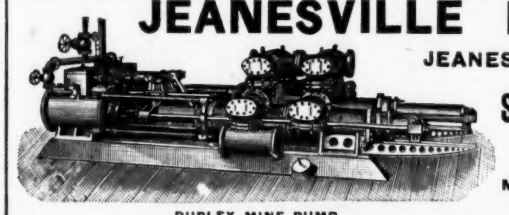

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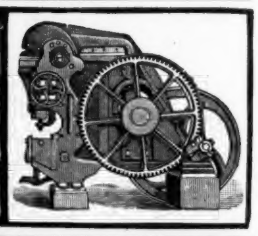

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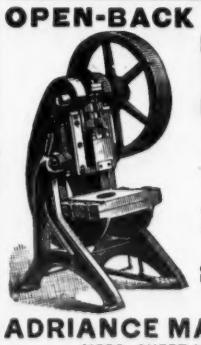

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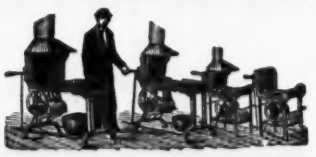

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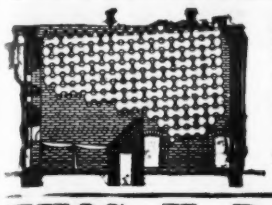

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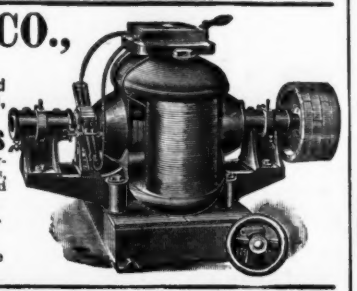

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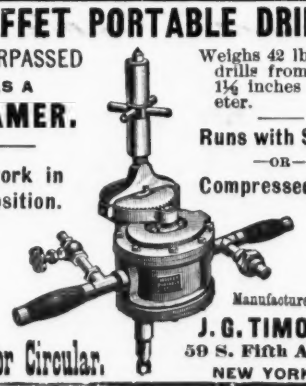

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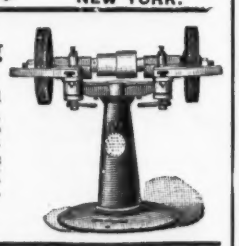

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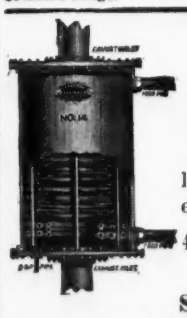

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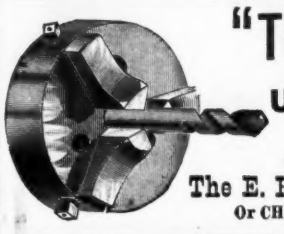

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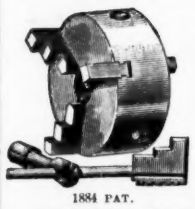

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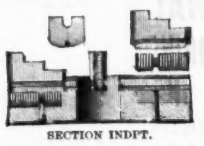

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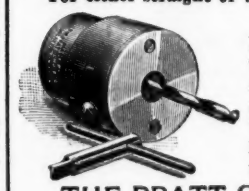

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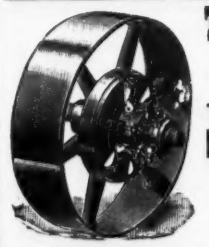

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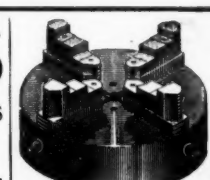

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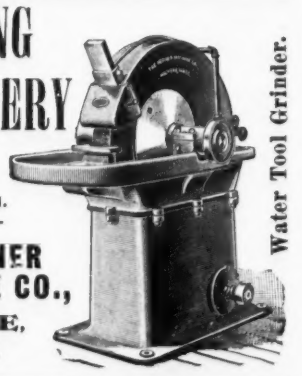

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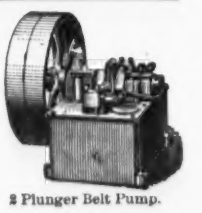

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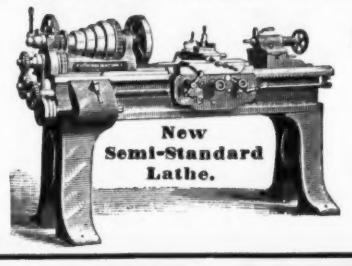

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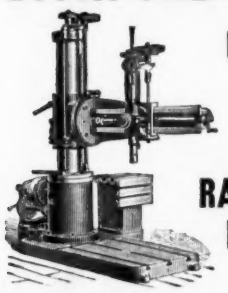

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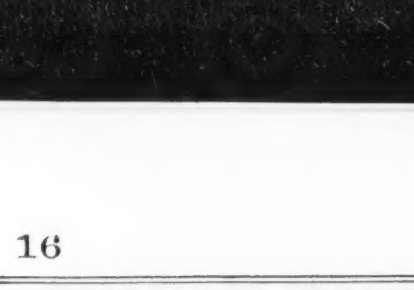

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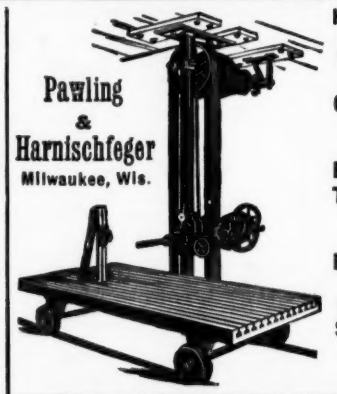

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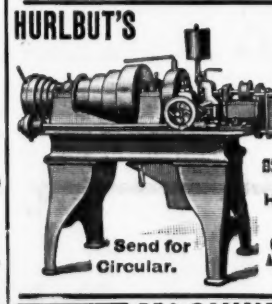

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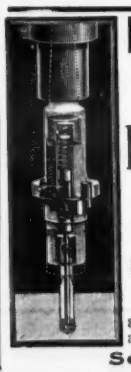

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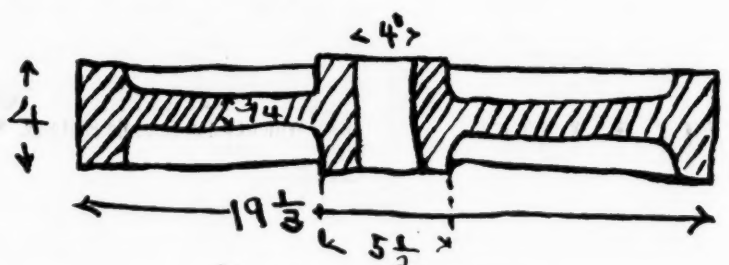

I have had Excellent luck with the spur gears the latter spoils the cutter like a charm. I did them after I got started in one hour & 45 Minutes Each & if I only took them 10 hours as I'd a piece at piece work so you see there is quite a difference

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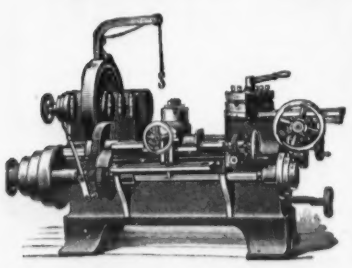

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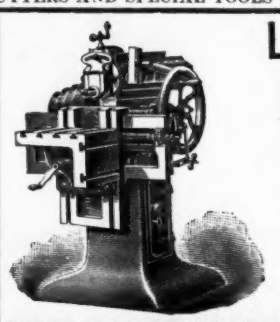

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OUR SPECIALTY
CRANK and GEARED SHAPERS.
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The Cincinnati Milling Machine Co.,
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PATENTED.
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MADE ONLY BY THE
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CENTER GRINDING MACHINE.
Price, $10. NO GAUGES. NO BELT.
Every Machine Guaranteed.
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Turret Drills
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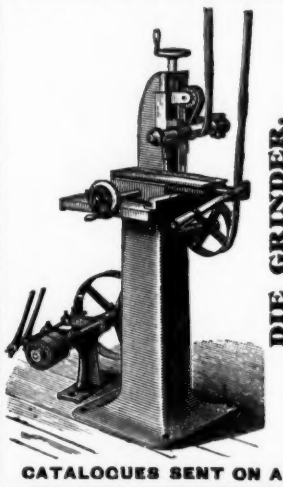

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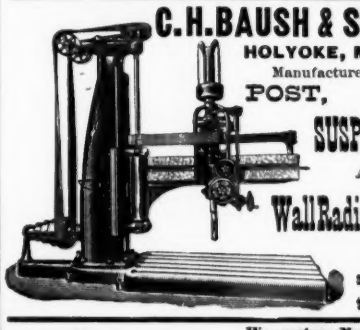
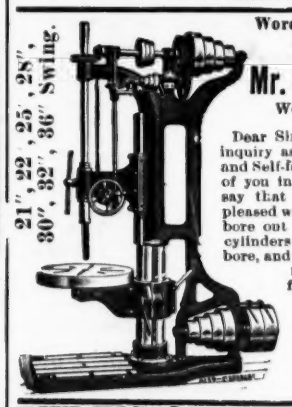


Worcester, Mass., Jan. 26, 1891.
Mr. J. E. SNYDER,
WORCESTER, MASS.



Dear Sir:—In reply to your inquiry as to the 25 in. B. G. and Self-feed Drill purchased of you in October last, would say that we are very much pleased with it. We got it to bore out and face up small cylinders having a 4 5-8 in. bore, and it is doing the work in a perfectly satisfactory manner.
Yours, etc.,
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PIPE CUTTING AND THREADING MACHINERY
For Hand or Power.
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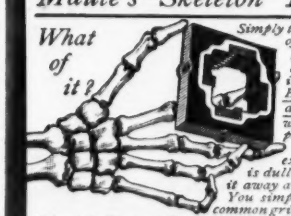

What of it?

Simply this: The first cost of it to you is less than that of any other Pipe-Threading Die. Also this: Before it becomes dulled from use it will cut as many perfect threads as the best Solid Die extant; and when it is dull, you don't throw it away and try a new one. You simply sharpen it on a common grindstone, and make it practically as good as new. And this sharpening process may be repeated a number of times.
Don't it sound like a money-saver? Ask your jobber to send you Price-List of
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PANCOAST & MAULE,
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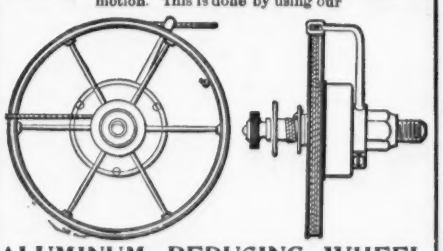
TO OBTAIN AN ACCURATE CARD WITH AN INDICATOR
It is necessary to use a perfect method of reducing the motion. This is done by using our



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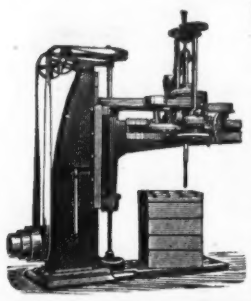

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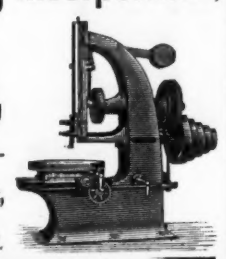

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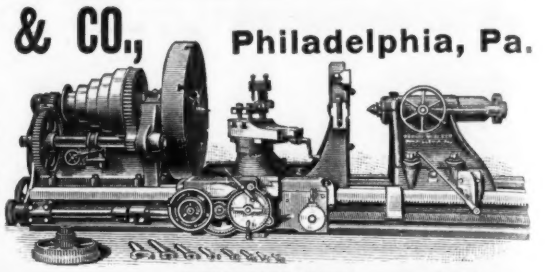

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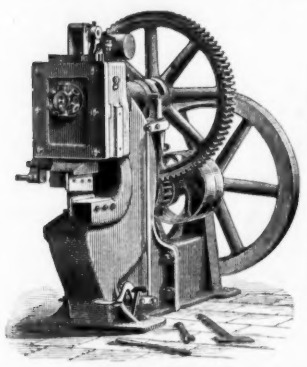

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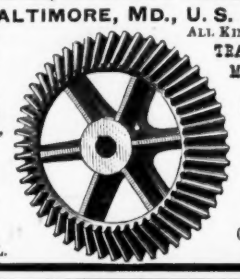

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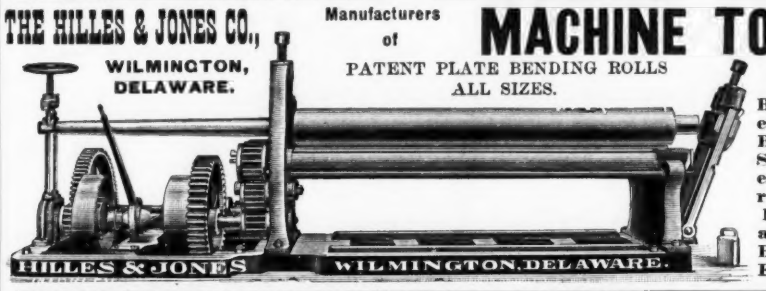

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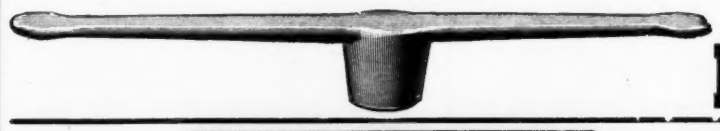

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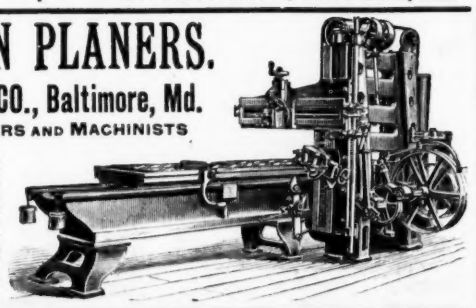

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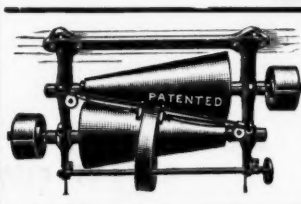
GENTLEMEN:—In reply to your letter of the 27th, we would say that we are very much pleased with the 36 in. x 30 in. x 10 ft. Open Side Planer bought from you about three years ago. We find it a strong and well-built tool, and have done a large amount of work on it where the castings extended six and eight feet from the upright, and have planed to forty-eight inches from the upright. The Open Side is a great convenience in handling long work. We have no reason to regret having bought the planer; on the contrary, the more we use it, the more we like it. Yours truly,

HILLARD, STERRIT & CO. (LIMITED).
H. M. WILSON, Secretary.



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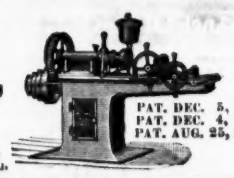

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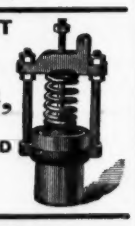

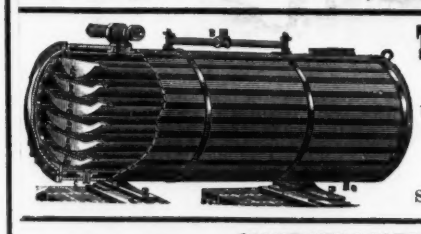

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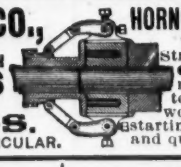

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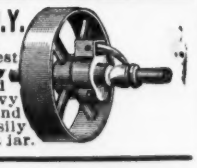

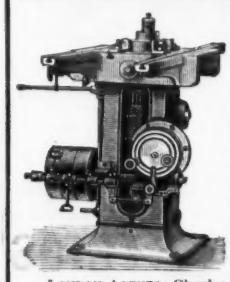

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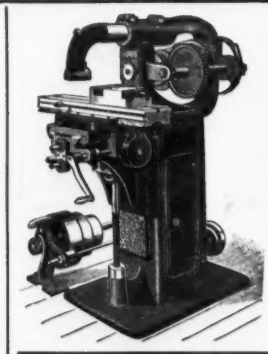

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MANUFACTURED BY

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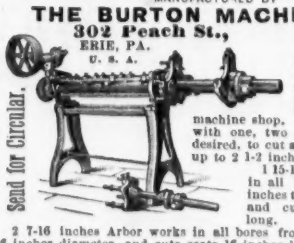

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4 7-16 inches Arbor works in all bores from 4 7-16 inches to 14 inches diameter, and cuts seats 26 inches long.

With an attachment for the purpose seats can be cut in holes as small as 1 inch diameter, by one passage of the cutter.

If the work is heavy and too large to be placed on machine it can be detached from stand and used as portable machine.

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THE LEADER.

With recent patented improvements we guarantee to do the following class of work.

To cut key-ways through 1¼-inch hole in hubs or sleeves 23 inches long, in iron, brass or steel, also make it dovetail to insert feather key.

Will cut through 4-foot hub, through 5-inch hole. Our new centering chuck and setting attachment the work can be set exactly, without the use of a scale or rule. Our new binding attachment saves three-fourths of the time used on any other machine for binding work on. Our machine will cut a key-way and make a key to fit it.

For particulars address THE MORTON M'F'G CO., MUSKEGON HEIGHTS, MICH.

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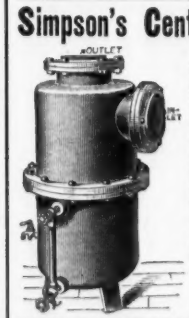

Extracts oil and foreign matter from the exhaust steam, thereby purifying same so that the water of condensation can be returned to the boilers. **Saves from 40 to 60 per cent. of the oil fed through the steam cylinder.** Constructed on the only correct principle, separation by centrifugal force. No baffle plates to obstruct the free flow of steam and create back pressure, as the flow of steam is continuous and takes a spiral course to the bottom, distributing the grease and foreign matter on the walls and surfaces during transit.

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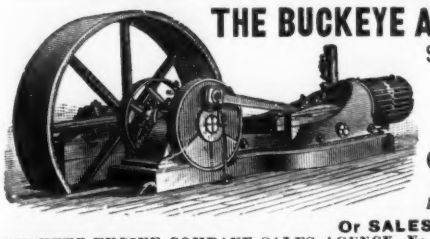

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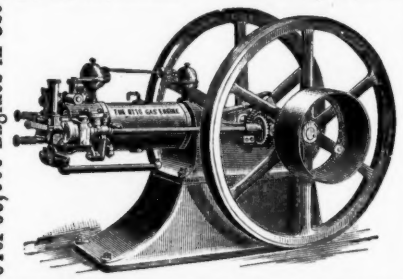

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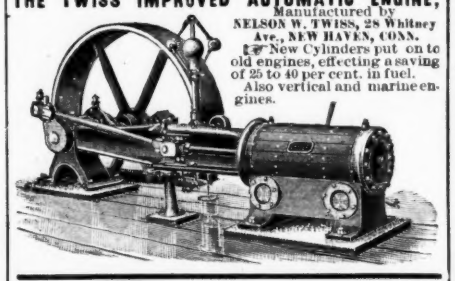

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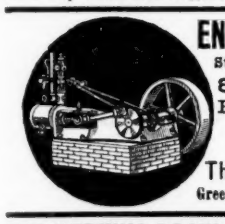

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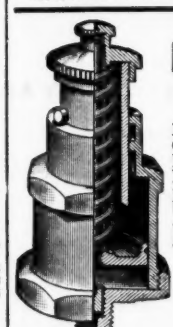

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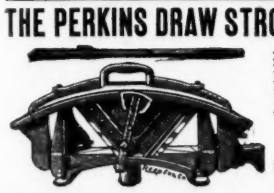

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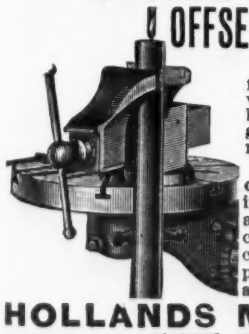

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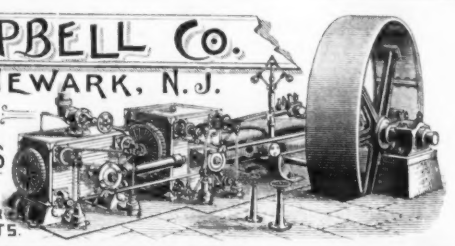

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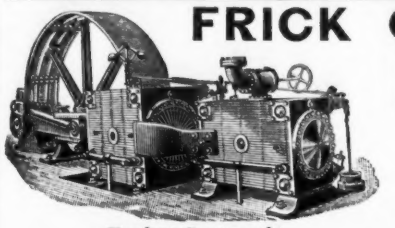

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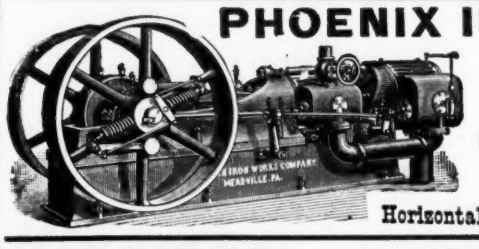

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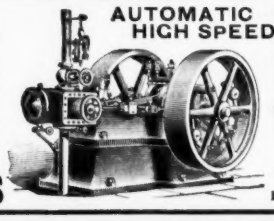

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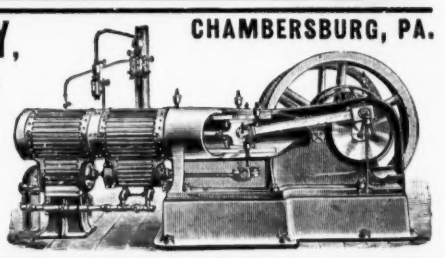

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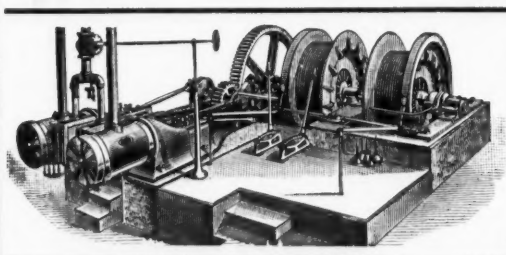

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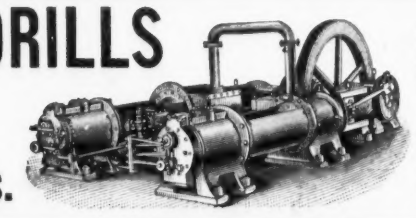

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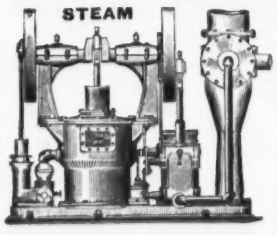

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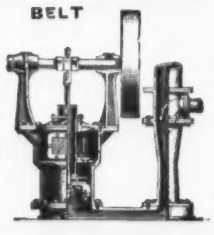

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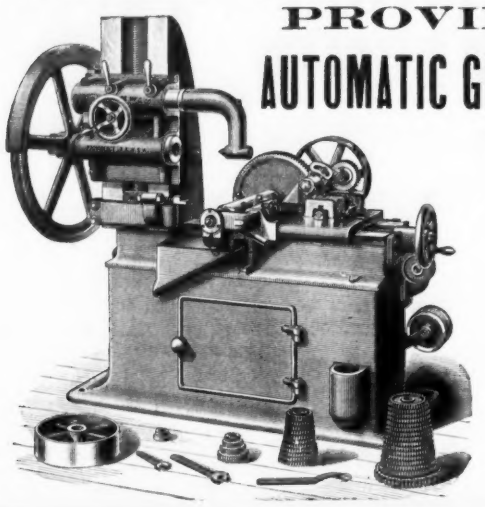

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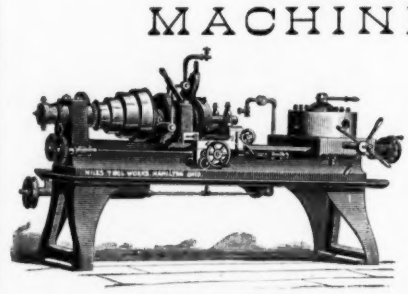

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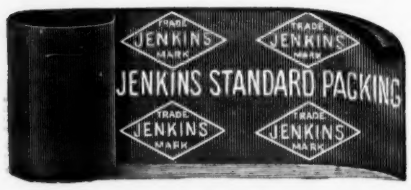

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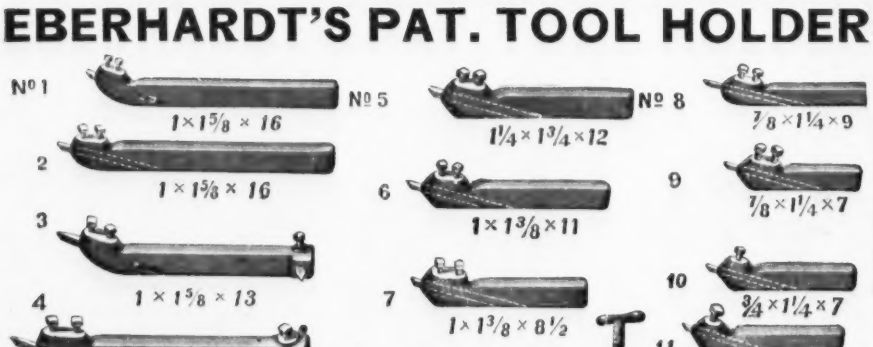

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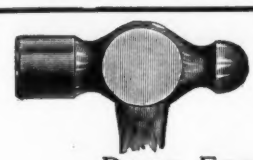

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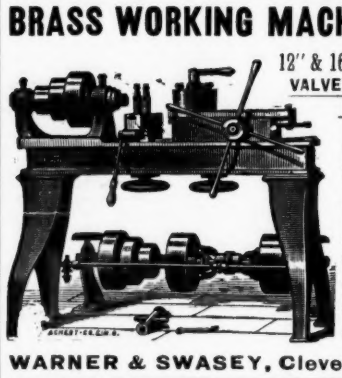

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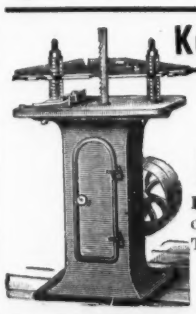

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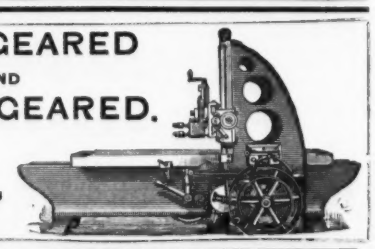

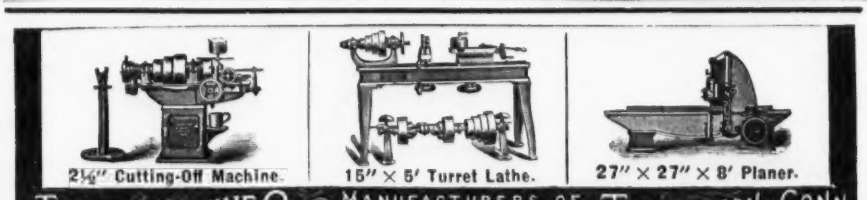

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